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NOTICE TO BINDER.

Volume L. has been issued in two parts, each containing the 'Journal' proper, paged with Arabic figures, and 'Extracts from the Proceedings' paged with Roman figures. This title and contents sheet should be placed first, and be followed by pages 1 to 172, then by pages 173 to 308. After that should come "Extracts from the Proceedings," pages i to lxviii, lxix to cxxiv, concluding with the General Index. Figures 46 to 49 should be inserted after p. 80.

JOURNAL

OF THE

ROYAL HORTICULTURAL SOCIETY.

VOL. L. PART I. 1925.

ARCTIC VEGETATION PAST AND PRESENT.

(THE MASTERS LECTURES FOR 1924.)

By Prof. A. C. SEWARD, Sc.D., F.R.S.

AN adequate treatment of the subject of Arctic Vegetation, past and present, is possible only to botanists who have studied both the floras of former ages and those which still exist in Arctic lands. I do not possess this double qualification: in defence of my temerity I offer the excuse that a visit to Greenland in the summer of 1921 revealed to me the beauties of an Arctic flora and stimulated my interest in the many problems suggested by the amazing contrast between the vegetation of to-day and the relics of ancient floras embedded in the rocks. It is an impressive experience to stand on a flower-sprinkled Greenland heath and to see on a piece of shale split from the face of a ravine fragments of fronds closely allied to those of a *Gleichenia* which one had previously seen in very different circumstances growing on a tangled bank of ferns on the edge of a Malayan forest. The interval of millions of years separating the living from the dead is for the moment forgotten. In place of the bleak, treeless hills and the heath-covered slopes one sees a luxuriant undergrowth of ferns against a background of conifers and broad-leaved trees. My aim to-day is to illustrate as far as I can the nature and meaning of this contrast.

The primary object of my visit to Greenland* was to collect fossil plants for the British Museum and my own University. I was

* SEWARD, A. C., *A Summer in Greenland*. Cambridge, 1922.
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accompanied by Mr. R. E. HOLTUM, who was then my Research Assistant and is now Assistant Director of the Botanic Garden at Singapore; he not only took an active part in collecting fossils, but obtained nearly 200 species of recent plants. A visitor to Greenland is the guest of the Danish Government, and I should like once again to express my gratitude both to the Danish officials generally and especially to Mr. MORTEN PORSILD, the Director of the Danish Arctic Station on Disko Island, for their friendly co-operation and hospitality.

Even if time were not a limiting factor I could not do justice to the subject of recent Arctic floras; but I can at least draw attention to some of the more obvious features, and by so doing, it may be, encourage others better qualified than myself to pursue a line of research which is both attractive and rich in promise. While specially emphasizing the past and present vegetation of Greenland, I shall attempt to consider, though necessarily only in bare outline, the Polar regions as a whole.

Greenland is in some respects the most interesting of all Arctic lands: it is the largest "island" in the world, nearly 1,700 miles long and with an average breadth of about 600 miles. With the exception of a narrow coastal strip, which has recently been shown to be broader on the northern edge than elsewhere, the whole of the interior of the mountainous plateau is permanently buried under an ice-sheet of unknown depth rising near the centre of the island to a height of more than 8,000 feet. The "dead storm-lashed desert of ice" forms an unbroken expanse for several hundred miles: here and there as the edge of the shield-shaped mass approaches the coastal belt a few mountain-peaks protrude as solitary islands on which some hardier species of flowering plants have successfully struggled against the rigour of an extreme Arctic environment. On one of these peaks ("Nunataks") in North-east Greenland (lat. 77° N.) 17 species of flowering plants were found. Through the deep fjords penetrating the high tableland the ice-sheet finds outlets to the sea, and every year innumerable icebergs launched from the fractured faces of glaciers litter the adjacent sea, many of them being carried by currents to the mouth of the St. Lawrence River and even farther south. In the warm summer months, were it not for the icebergs and occasional patches of snow and ice in sheltered hollows on the rocks, a visitor to the west coast of Greenland might imagine himself in a much more southern region.

The greater part of Greenland consists of Archaean igneous rocks, gneisses, and schists closely allied to those of the Scandinavian highlands and the north-west highlands of Scotland, which once formed portions of a single northern continent. The part that is now Greenland, one of the oldest land-masses in the world, has been partially and intermittently invaded by the sea along its edges. I am not now concerned with the evidence of marine invasions in the extreme north afforded by the masses of coral limestone described by the Danish geologist, LANGE KOCH, as veritable coral reefs, but only with

certain more recent sandstones, shales, and seams of coal containing stems, foliage-shoots, and leaves of plants which grew on the borders of rivers and estuaries at different geological periods. On Disko Island, Upemivik Island, and the adjacent parts of the mainland sedimentary rocks reaching a thickness of over 1,000 feet rest on the uneven surface of the Archaean land, which during a temporary submergence received the material carried by streams flowing over slopes covered with forest trees and luxuriant ferns. These old sediments of river-deltas, freshwater lakes, and brackish estuaries were in the early days of the Tertiary period buried under a series of lava-flows and successive accumulations of volcanic ash which saved them from destruction by denuding agents.

The state of Greenland to-day is believed to offer a fairly close parallel to that of the British Isles during the last great Glacial period. Lying on a heath-covered hill-side surrounded by a wealth of flowers, the sea in front strewn with icebergs, and behind the ice-covered summits of the mountains, it needs but a slight mental effort to transport oneself to England as it was some thousands of years ago. The question suggests itself—may not some of the hardier members of the pre-Glacial flora of Britain have been able to survive in sheltered, ice-free localities even during the maximum phase of the Glacial period? The view that our present flora is almost entirely post-Glacial in age, that the arctic conditions completely destroyed the vegetation, becomes difficult to accept when we see the "friendly Arctic" in its summer dress.

From the whole of Greenland about 400 vascular plants are recorded; the total number collected north of the Arctic Circle is smaller. The northern limit of trees may conveniently be taken as the southern boundary of the Arctic flora. In the extreme south of Greenland trees reach a height of ten feet or rather more, but in the district which we visited the Willows and the Dwarf Birch, the sole representatives of trees, rarely exceed two feet in height and generally grow as stunted, prostrate shrubs. Miniature woods of *Salix glauca* are recorded from lat. 73° N. in West Greenland with trees three feet in height. The course of the line which marks the position of the farthest outposts of the forest vegetation of the Northern hemisphere varies within wide limits: in some places it dips far below the Arctic Circle, while in others it invades much higher latitudes. It is noteworthy that the White Spruce (*Picea canadensis*) is able to attain a height of 40 or 50 feet in sheltered situations as far north as 69° N. in Canada and Alaska. On the other hand, KIHLMAN has given a vivid picture of the inability of trees to cope with the desiccating effects of the cold winds in the much more southern Russian Lapland. The geographical distribution of the White Spruce affords an instructive example of the ability of a species to live under a wide range of temperature. SARGENT states* that

* Quoted by THEO. HOLM in vol. v. ("Botany") of the *Report of the Canadian Arctic Expedition, 1913-18*, p. 88 Ottawa, 1922.

"it inhabits the banks of streams and lakes and the borders of swamps in rich, moist alluvial soil, ocean cliffs, and less commonly at the north rocky slopes of low hills; it ranges from the shores of Ungava Bay in Labrador westward to those of Hudson Bay, and from the south of Seal River not far to the north of Cape Churchill it is scattered along the northern frontier of the forest nearly to the shore of the Arctic Sea, and, crossing the continental divide, reaches Bering Strait in 66° North latitude. Southwards it extends down to the shore, and to northern New Hampshire, Vermont, New York, northern Michigan and Minnesota and the Black Hills of Dakota, and through the interior of Alaska and along the Rocky Mountains to northern Montana."

We may now briefly notice the more striking characters of the Arctic flora of the present day. The absence of trees is an obvious feature. In the Arctic regions there is an explosive development in the early summer: the previously formed flowers and foliage-shoots suddenly emerge; we miss the succession of phases in the floral display of more southern countries. The continuous sunlight and the concentrated effort necessitated by the shortness of the growing season preclude the more orderly separation of flowering dates that is a familiar feature in temperate latitudes. Instead of a series of scenes, each with its special colouring, we have a composite picture when the season is at its height followed by a wonderful variety of autumn tints.

There is a natural tendency to overestimate the effects of intense cold as a limiting factor. To many species the low temperature of Arctic regions is undoubtedly fatal, but as in human beings so also in plants there is a wide range in resisting power; it is not so much the habit or structure of a plant that gives it superiority over others in ability to endure the most severe demands which Nature can make, but the constitution of the living protoplasm of the cells. As SCHIMPER says, "as far as we know at no place on the earth is the temperature so low that no plant can withstand it." The solitary mountain peaks surrounded by the eternal ice of the Greenland plateau are by no means bare of vegetable life. In Grinnell Land north of lat. 82° N. there is a fairly rich vegetation, and from the northernmost edge of Greenland several flowering plants have recently been described. Flowering plants have penetrated to the polar fringe of the northern hemisphere though they have failed to colonize the highest regions in the Alps. In Nova Zembla at the end of June we are told that there are still wide areas under snow, and in the middle of April the vegetation is still wrapped in deep sleep. At Jakobshavn (lat. 69° N.), about half-way up the west coast of Greenland, the mean temperature in July over a series of years was 47° F. and the mean temperature in February 36° below freezing-point. In London the corresponding records are 60° F. for July and 42.6° F., that is about 10° F. above freezing-point, for February. At Jakobshavn July is the only month in which during several years

the thermometer did not fall below freezing-point. The annual rainfall at Jakobshavn is approximately 9 inches a year. At the beginning of the restricted period of two or three months of continuous sunlight, in some places frequently screened by thick curtains of fog, the delicate yet wonderfully resistant mechanism of the plant's body is suddenly set in motion, and in an incredibly short time the whole life-cycle is completed or, it may be, the final stages are reached after the vegetative parts have begun their winter rest. There are some Arctic species, especially the southern elements inhabiting tarns and lakes, which rarely or never set seed, but a large number of the true Arctic species carry their annual task to completion.

Lichens play an important part in the scheme of Arctic colouring : rock-faces are spotted with patches of black, white, and vermilion crustaceous species ; miniature bushes of light yellow and greenish-grey lichens are scattered through the shrubby carpet of flowering plants. Spongy, emerald-green cushions of moss and the large, light green leaves of *Alchemilla* mark the course of streams in rocky channels cut through the darker hill-sides. Rich brown clumps of *Oxyria*, the brilliant flowers of Willow-herbs, clumps of golden Arnicas, the Arctic Poppy with its pale yellow cups, and tufts of *Cerastium* relieve the sombre monotony of boulder-strewn beaches and the tumbled masses of detritus left by floods at the annual melting of the ice. Cushions of the Moss Campion (*Silene acaulis*), a varied assortment of Saxifrages, compact colonies of *Diapensia*, the erect flowering shoots of *Pyrola grandiflora* above rosettes of polished, brown leaves, and patches of *Dryas integrifolia* are scattered among the lichen-encrusted rocks of the hill-sides. Wide stretches of heath are sprinkled with flowers of *Cassiope tetragona*, scented flower-heads of *Ledum*, the pendulous bells of *Phyllodoce*, in company with profusely flowering willows and many other shrubby plants. On the marshy borders of river-deltas the waving plumes of the Cotton-grass form a pleasing contrast to the darker colour scheme of the Sedges and the lighter green of the Horsetails. The fleshy-leaved British species *Arenaria peploides* and *Mertensia maritima* with the sand-dune grass *Elymus arenarius* give a familiar aspect to some of the Greenland beaches.

A few of the commoner vascular plants have been selected in illustration of the wide geographical range of Arctic species. Among Pteridophytes one of the most abundant is *Equisetum arvense*, a plant which occurs along the whole length of the west coast from Cape Farewell to north of Melville Bay, and is widely spread over the north temperate and arctic zone of both the old and new world. Another common species is *Lycopodium Selago* : this familiar British Club Moss is recorded from Grinnell Land in latitude 81° N., and is circumpolar in its range ; it flourishes on the Alps and Pyrenees, on the Appalachian and Altai mountains, in New Zealand, Australia, Antarctic America, Brazil, and the Himalayas. *Cystopteris fragilis*, the Brittle Fern, is another circumpolar plant which, in Spitsbergen, reaches lat. 79° N. ; it grows in South Georgia between lat. 54° and 55° S., on the Andes

the highlands of Abyssinia, and in tropical Africa. The Holly Fern, *Polystichum Lonchitis*, is also a widely spread type, extending far beyond the limits of Arctic countries: it is recorded from an altitude of 12,000 feet in Central Asia and from 8,000 feet in the Alps. A very good sketch of the vegetation of West Greenland, by Mr. HOLTUM, was published in the *Journal of Ecology* in 1922, and several additions to the flora of Greenland have recently been made by Professor OSTENFELD of Copenhagen. I have freely drawn upon the admirable account of Arctic vegetation in the wider sense by Mr. THEO. HOLM, published as a Report of the Canadian Arctic Expedition of 1913-18.*

The only true Arctic annual in the Greenland flora, according to Mr. PORSILD, is the small Polygonaceous species *Koenigia islandica*. This plant extends slightly beyond lat. 74° N. on the east coast of Greenland; it occurs on some of the islands of the American Arctic Archipelago, in Spitsbergen, Arctic Scandinavia, Arctic Russia, and Nova Zembla. It is a remarkable fact that there are very few flowering plants endemic to Greenland. A Pondweed (*Potamogeton*) has been described as an endemic species, and recently Professor OSTENFELD has described three other flowering plants collected by the late Dr. WULFF on the north coast as peculiar to Greenland. The probability is that some species survived the Glacial period, but whether this is so or not it is generally agreed that most of the components of the present Greenland flora are migrants from other lands where they were better able to endure or to escape from the severe conditions associated with the maximum extension of the ice. About 36 per cent. of the flowering plants are Western and circumpolar species, and these, as PORSILD suggests, may have entered Greenland by way of Smith Sound off the north-west coast. The more southern species may, as NATHORST believed, have crossed from Europe by a land-bridge of which the Faroe Islands and Iceland are surviving fragments, or, more probably, some were introduced by the early Norse colonists in the tenth century and others were carried across the sea by natural methods of dispersal. The flora is partly American and partly European in origin and to a large extent post-Glacial in its occupation of the island.

Dr. FLODERUS in his monograph on Greenland Willows† recognizes five species, *Salix herbacea*, *S. arctica*, *S. glauca*, *S. Uva-Ursi*, and a new species, *S. chlorocladus*, and several hybrids. A characteristic feature of Arctic vegetation, well illustrated by the Willows, is the profusion of reproductive shoots in proportion to vegetative branches, also the extensive root-system, which though unable to penetrate far in a vertical direction because of the permanently frozen ground at a depth of one or two metres may spread several metres horizontally. Another noteworthy feature is afforded by the very narrow annual rings in the short and often gnarled stems. The geographical distri-

* I am also greatly indebted to my friend Mr. PORSILD, who has in preparation a Flora of West Greenland.

† Published in the *Meddelelser om Grønland*, 1923.

bution of *Salix glauca* is shown in the table below. The most northerly tree in Greenland, as in Norway and Lapland, is the Dwarf Birch (*Betula nana*). This Arctic and sub-Arctic species is distributed across Europe and Asia; it occurs in the Swiss Alps, the mountains of Bohemia, Bavaria, the Jura, and Carpathians. It is only in the more southerly parts of Greenland that the Juniper, *Betula glandulosa*, *Sorbus americana*, and *Alnus ovata* are able to exist. Among the commoner Monocotyledons are many species of Grasses, Sedges, and

POLAR REGIONS.													
	Amer. Arctic Arch.	Greenland	Spitzbergen	Arct. Scandinavia	Arct. Russia	Nova Zembla	Arctic Siberia	Iceland	Alps & Pyrenees	Caucasus	Behring Str. (Asia)	Himalayas	Altai Mts.
<i>Cystopteris fragilis</i>
<i>Polystichum Lonchitis</i>
<i>Equisetum arvense</i>
<i>Lycopodium Selago</i>
<i>Alopecurus alpinus</i>
<i>Tofieldia palustris</i>
<i>Salix glauca</i>
<i>Polygonum viviparum</i>
<i>Oxyria digyna</i>
<i>Silene acaulis</i>
<i>Lychnis apetala</i>
<i>Papaver nudicaule</i>
<i>Saxifraga oppositifolia</i>
<i>Dryas octopetala</i>
<i>Dryas integrifolia</i>
<i>Pyrola grandiflora</i>
<i>Loiseleuria procumbens</i>

Rushes, also species of *Potamogeton*, one of the genera which is common to more southern latitudes and the Arctic mountain tarns. The species *Potamogeton pusillus* occurs over the whole of Europe; across temperate Asia it spreads to Corea and Japan; it extends over large areas in Africa and in North and South America. Several Grasses are widely distributed in Arctic lands: one of these, *Alopecurus alpinus*, is especially well developed in the neighbourhood of settlements where the ground is rich in nitrogenous material; it occurs also in the northern parts of North America, in the Rocky Mountains, in North and South Russia. At Englishman's Harbour, an exceptionally favourable locality near Godhavn on Disko Island, we saw vigorous

plants of two species of the Orchidaceous genus *Habenaria* in full flower: *Habenaria albida*, which occurs also in Iceland, the Faroe Islands, western and northern Europe, and the Ural Mountains, with *H. hyperborea*, a North American and Icelandic species. Associated with these was the Tway blade, *Listera ovata*, an Orchid ranging from northern North America through North, East, and Central Europe to Iceland, the Faroe Islands, and Siberia. The white, fluffy heads of the common Arctic Cotton Grass, *Eriophorum Scheuchzeri*, were conspicuous on marshy ground: this species, which reaches the northernmost region of Greenland, occurs in northern North America, Iceland, Scandinavia, Russia, on Central European mountains, in Siberia, and elsewhere. There are numerous representatives of the genus *Carex*. The small Liliaceous plant *Tofieldia palustris*, which is common in moist places, extends through Arctic Europe to the Urals and the Swiss Alps. Of the Polygonaceae *Polygonum viviparum* and *Oxyria digyna* are both plentiful: they reach as far as northernmost Greenland and are both circumpolar in their distribution. *Oxyria digyna* grows on the Alps, the Pyrenees, the Caucasus, and the Altai Mountains, the Himalayas, and the Rocky Mountains. *Silene acaulis*, the most familiar Arctic and Alpine Caryophyllaceous plant, in some Greenland localities forms cushions more than a yard across: it occurs in almost all Arctic countries; in the Swiss Alps it reaches an altitude of over 9,000 feet and is recorded from 13,000 feet in Colorado. Other widely distributed members of the same family are *Melandryum apetalum* (*Lychnis apetalum*), *Melandryum pauciflorum*, a circumpolar plant with smaller flowers and a less inflated calyx than *M. apetalum* which occurs also on the high mountains of Asia, where Professor OSTENFELD places its original home, and *Cerastium alpinum*. In addition to several species of *Ranunculus* the Greenland flora includes *Thalictrum alpinum*, an attractive plant with violet-coloured filaments and yellow anthers, which reaches the south of Europe, North Africa, and the Himalayas. *Papaver radicum*, closely allied to *P. nudicaule*, is a circumpolar species which extends to the northernmost coast of Greenland. The Cruciferae are well represented, especially by species of *Draba*. Saxifrages play a conspicuous part in the summer show, and one of the most brilliant is *Saxifraga oppositifolia*, the species with the most extreme Arctic distribution; it has a wide range in sub-Arctic Europe and America, and occurs on the Altai Mountains and the Himalayas. Colonel FEILDEN states that he found shoots of this Saxifrage showing green buds in Grinnell Land in February. *Potentilla* is represented by several species; two other Rosaceous genera are noteworthy: *Alchemilla glomerulans*, with unusually large leaves for an Arctic plant, is abundant also in Norway and Sweden and occurs in Labrador, Switzerland, and the Pyrenees; *Dryas octopetala* and *D. integrifolia* both occur in Greenland, but on the west coast the latter is the common form. The British species *Dryas octopetala* is circumpolar; it has spread to the Alps and Pyrenees, the Caucasus and the Altai Mountains, from the Rocky Mountains to Colorado and

other districts. The Crowberry, *Empetrum nigrum*, often associated with the Bilberry, is one of the commonest heath-plants in Greenland ; like the Fern *Cystopteris* it has travelled along the Andes to the remoter parts of South America. *Chamaenerium* (*Epilobium*) *latifolium*, the handsomest species of Willow herb, is a widely distributed Arctic plant. *Pyrola grandiflora* is one of the most attractive plants in the Greenland flora ; it extends to the Altai Mountains, the Swiss Alps and Pyrenees. Common plants on the heath-land are *Ledum palustre*, with its closely packed, scented heads of white flowers, a circumpolar species which reaches Japan ; *Rhododendron lapponicum*, *Diapensia lapponica*, a cushion plant, *Loiseleuria procumbens*, a circumpolar species represented in the British flora, *Cassiope tetragona*, and *Phyllodoce coerulea*. *Phyllodoce* has an Arctic Atlantic distribution ; it occurs in Scotland, the Altai Mountains, East Siberia, and the Pyrenees. *Cassiope tetragona*, distinguished by its grooved, four-ranked leaves and delicate yellow bells, has a wide range in North America as far south as Montana and Oregon, and stretches across the north of Siberia : it is suggested by RIKLI* that the original home of this species is East Central Asia. *Pedicularis lanata* and *P. hirsuta* are prominent members of the Scrophulariaceae. *Campanula uniflora* and the beautiful Harebell, *C. rotundifolia*, which has wandered to North Africa and the Far East, are widely distributed in Greenland and other Arctic lands. The Compositae are represented by several genera, notably *Antennaria*, *Erigeron*, *Arnica*, *Taraxacum*, and *Gnaphalium*. *Arnica alpina* and *Antennaria alpina* are both circumpolar species which occur on both sides of the Behring Strait.

The vegetation in Arctic regions is at present composed almost entirely of herbaceous plants ; the fossils preserved in the rocks of high northern latitudes are almost all derived from trees. This very striking difference raises some interesting questions : allowance must be made for the fact that arborescent species have a better chance of preservation as fossils than the more delicate and smaller herbaceous plants ; and if we picture the conditions in a country where alpine or arctic vegetation occurs on the higher ground, and the lower slopes of the hills and the valleys are inhabited by other associations, we realize that the streams which carry leaves and twigs to the area of deposition of the sediments are more likely to draw material from the vegetation nearest to them than from that which is beyond the limits of the river-system. But taking these considerations into account, the analysis of fossil floras furnishes abundant evidence of the predominance of arborescent over herbaceous plants. On the other hand there is no good reason for denying the possibility of the existence of an alpine flora in the Cretaceous and Tertiary periods in Greenland and other Arctic lands of which no traces have been preserved. The samples of the vegetation of these ages may have been derived from the foot-hills and plains, while the contemporary flora of the higher ground left no record of its existence.

* RIKLI, *Botanische Jahrbücher* (Engler), 1914.

The greater abundance of herbaceous species in Arctic floras suggests another problem which has an evolutionary interest. Professor JEFFREY of Harvard points out that it is a fact of obvious significance that the highest vertebrates and the highest plants have had a nearly contemporaneous existence. The warm-blooded mammal is "in reality rendered possible by the appearance of the herbaceous type in the Angiosperms, which directly or indirectly supply the most important part of the food of all the higher animals."* He is inclined to think that herbaceous flowering plants are derived from arborescent ancestors and that prolonged periods of glaciation were potent factors in the process of converting the architectural plan of the tree into that of the herb. The American botanists SINNOTT and BAILEY,† while accepting the view that progressive refrigeration in the temperate zone gave the stimulus to the development of herbaceous Angiosperms, do not agree with JEFFREY's explanation of the methods by which the anatomical change was effected. A comparative examination by FORSAITH‡ of the stem structure of species of *Betula*, *Alnus*, and *Rhododendron* from the alpine regions of New Hampshire and lowland localities has shown that the alpine species are characterized by a reduction of the softer tissues of the medullary rays in the wood, which he attributes to the effect of the cold, bleak conditions on the mountain summits.

Palæobotanical evidence lends support to the conclusion that the present abundance of herbaceous plants is a comparatively recent phase of evolution. We have very little knowledge of the steps by which this transformation was produced. The shorter life-cycle of herbaceous plants and the greater ease with which they find protection under the snow during the winter give them advantage over trees as organisms adapted to an Arctic environment; but whether it was in response to adverse climatic conditions that the herbaceous type was evolved we do not know.

Sir JOSEPH HOOKER in his well-known paper on the "Outlines of the Distribution of Arctic Plants" § adopted the view, first advanced by EDWARD FORBES and afterwards extended by DARWIN, that the change in climate foreshadowing the Glacial period compelled the Arctic flora to retreat towards the south along many routes, some of which led to regions that it was possible to traverse while along other lines impassable barriers were encountered. Some of the northern travellers crossed the Equator. At a later date, when the ice had receded, many of the wanderers returned to their original home in the far north while others ascended the mountains in more southern lands. As HOOKER says, the Arctic flora girdled the globe in the polar regions and on the exodus to the south some of its members established themselves in Australia and New Zealand. During the return journey to the north some southern foreigners accompanied their temporary

* *The Anatomy of Woody Plants*. Chicago, 1917.

† SINNOTT and BAILEY, *Annals of Botany*, vol. xxviii., 1914, and vol. xxxvi., 1922.

‡ *Ecology*, vol. i., 1920, p. 124.

§ *Trans. Linn. Soc.*, vol. xxiii., 1860.

associates. Whether or not this briefly stated conclusion presents a true picture of the events consequent on the Glacial period, it is certain that the Arctic flora of to-day includes a large number of species which range far to the south. There is a mixture of northern and southern types. These facts are relevant to a consideration of the floras of the past which furnish evidence of an almost world-wide distribution of certain species in different geological periods.

The Arctic conditions of the present day, though to some extent reflected in the habit and structure of the plants, have not led to the development of any well-defined morphological features which can be recognized as distinguishing peculiarities of the outposts of the world's vegetation. Many Arctic plants are characterized by features that can be correlated with the circumstances in which they live: morphological characters which have the effect of economizing water; the crowding of the stunted foliage-shoots into a cushion-like mass; the extensive development of subterranean organs, and the wealth of flowering shoots. But these and other characters are familiar in Alpine floras and in associations met with in many different regions. It may be that one of the most distinctive characteristics of Arctic plants is the common practice of producing the buds near the ground where they can more easily find protection during the winter through a covering of snow or dead leaves. The Danish botanist RAUNKIAER in his classification of plants into life-forms or biological types speaks of the forms characteristic of Arctic countries as Chamaephytes. It is, however, worthy of remark that an investigation of the anatomical structure of Arctic plants undertaken by WARMING and other Danish botanists has not revealed any striking attributes which are peculiar to dwellers in the polar zone. The researches of the late GASTON BONNIER, who compared the habit and structure of species of European plants grown in continuous light and under normal conditions, demonstrated well-marked anatomical differences. But we have little knowledge of the physiological aspects of Arctic plant-life.

In order to point the contrast between the present and the past I propose to refer very briefly to a few of the many floras which have been discovered in Arctic regions, describing more fully some of the records of Cretaceous and Tertiary vegetation in Greenland. We will begin with the Devonian period, a period which is believed to be separated from the present by about 300 million years. One of the largest collections of Upper Devonian plants is that from Bear Island (lat. 75° N.) to the south of Spitsbergen: this includes several well-developed fronds similar in habit to those of modern Ferns but probably borne by plants belonging to a wholly extinct group; stout stems of *Pseudobornia* bearing whorls of lobed leaves; numerous stems of an extinct Lycopodiaceous plant specifically identical with *Cyclostigma killiorkense*, a familiar fossil in the Devonian rocks of the south of Ireland, and several other types. The vegetation was luxuriant: the remains preserved in the Bear Island strata show no

signs of inferiority in size to similar Devonian species from more southern latitudes. From the still more northerly Ellesmere Land several large fern-like fronds (*Archaeopteris*) have been obtained which are at least as well developed as examples of the same species from southern Russia. A few Upper Devonian plants have been found in Spitsbergen, but a much richer flora has left abundant traces in the lower rocks of the Carboniferous period; including fern-like fronds, large dichotomously branched stems of *Lepidodendron* and many elaborately constructed seeds. This Carboniferous Spitsbergen flora affords striking evidence not only of an advanced type of organization, but of the occurrence of well-grown trees. The older Arctic floras exhibit no distinguishing features which can be correlated with adverse climatic conditions. A few fossil plants have been described from lat. 80° N. on the east coast of Greenland which, though fragmentary, demonstrate the occurrence in this high northern locality of species which grew in the British Isles in the early days of the Carboniferous period.

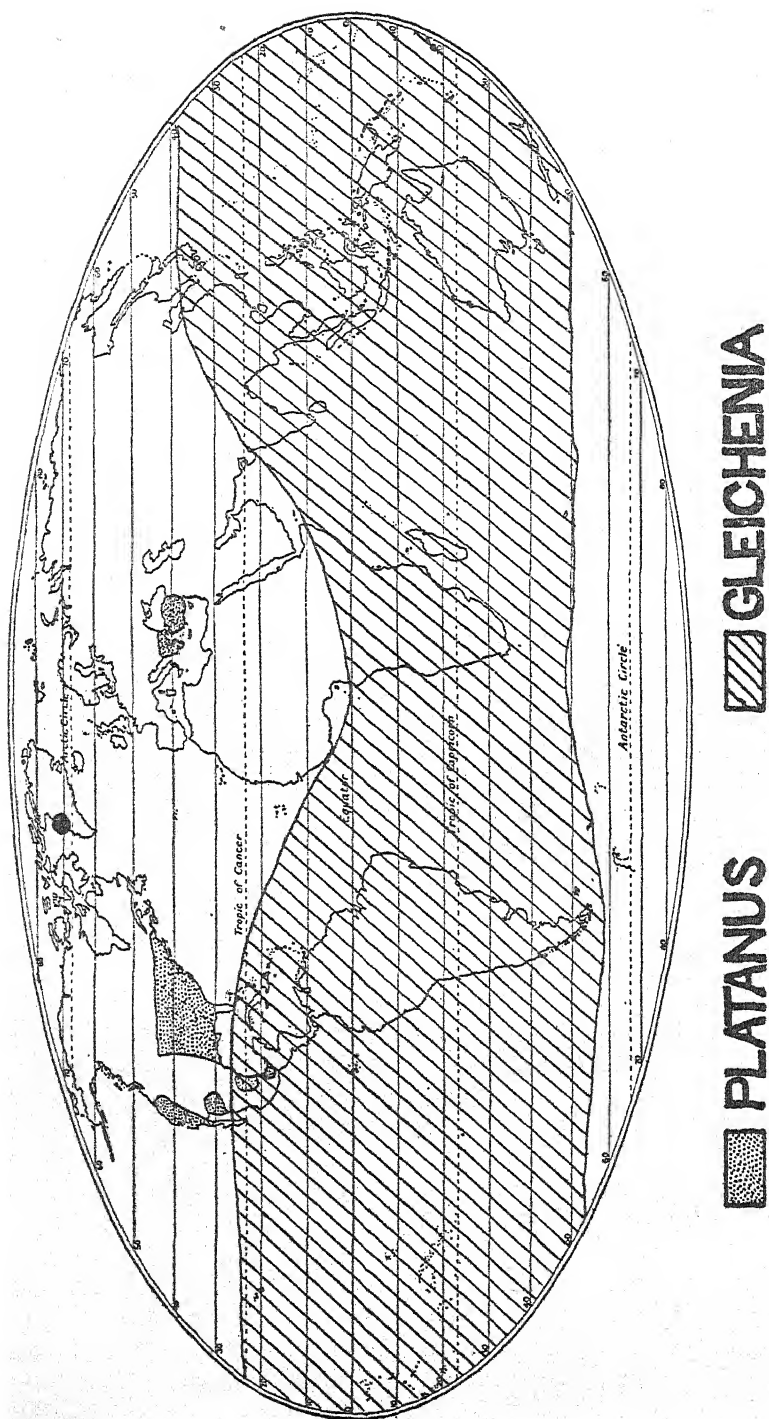
From the neighbourhood of Scoresby Sound, in lat. 70° N., about half-way down the east coast of Greenland, a very large number of fossil plants have been collected which agree closely with members of the rich Rhaetic flora of southern Sweden. A comparison of Rhaetic and Jurassic floras in widely separated parts of the world does not furnish evidence of any well-marked differences correlated with latitude between the several ancient plant-associations which are comparable to those shown by floras of the present day. It is inconceivable that the climate of the world in the latter part of the Palæozoic era and during the Mesozoic era was uniform; there must have been then as now differences depending upon latitude, but the point is that such data as we possess do not enable us to detect well-defined distinguishing features between the extinct floras of Arctic lands and those of more southern regions. Differences in detail can be recognized: there are no broad differences such as we find to-day.

Fossil plants discovered in the New Siberian Islands similarly indicate climatic conditions very different from those of the present day in the Triassic, Jurassic, and Tertiary periods. Many Jurassic plants have been obtained from Franz Josef Land, Spitsbergen, and Alaska, including leaves of *Ginkgo* differing but slightly from those of the living Maidenhair tree, many twigs and cones of Conifers, some of which are probably closely related to the Sequoias of California, and several other plants of a type now unknown in Arctic floras. A considerable number of species of arborescent Dicotyledons, of Conifers, and Ferns of Cretaceous and Tertiary age have been recorded from circumpolar countries which bear a close resemblance to plants which are now sub-tropical or even tropical in their range. One of the most remarkable examples of a tropical genus which existed in Greenland in the Cretaceous period was furnished by NATHORST's discovery of leaves and flowers of an *Artocarpus* in Disko Island. From Ellesmere Land NATHORST recorded the occurrence of numerous

twigs of a Conifer almost identical with those of *Sequoia sempervirens*, and from Sabine Island, off the east coast of Greenland (lat. 75° N.), impressions of large leaves of *Ginkgo* and fragments of other plants have been collected. The rocks of northern Siberia have furnished similar evidence of the existence in former periods of a varied and comparatively rich flora.

These are but a few of the records of floras which flourished within the Arctic Circle or a short distance to the south of it during a succession of geological periods, but they all tell the same story. Let us now consider more closely a few of the numerous relics of a Cretaceous flora which has been discovered in the sedimentary strata on the west coast of Greenland, in the neighbourhood of lat. 70° N. Ferns are particularly abundant, and of these the most plentiful are specimens referred to the genus *Gleichenia*: the fronds are dichotomously branched and occasionally the remains of a terminal bud are preserved in the angle of the divergent branches. Some of the specimens are sufficiently well preserved to enable us to recognize the main features of their anatomical structure, and exceptionally good specimens of sporangia have also been found. In habit, in structure, and in the characters of the sporangia, the Cretaceous Ferns are almost identical with species of *Gleichenia* that are now characteristic of the southern tropics. *Gleichenia* has long since disappeared from Europe, and its present distribution, shown in the map on p. 14,* affords a remarkable contrast to its range during the earlier stages of the Cretaceous period. Another Greenland Cretaceous Fern appears to be nearly related to the tropical *Matonia* of the Malayan region. With the Ferns and Conifers are associated many broad-leaved Dicotyledons, and of these one of the most abundant is a species hardly distinguishable from the present Plane-tree. The present geographical range of *Platanus*, which my friend Mr. Good of the British Museum has kindly prepared for me, is placed side by side on the map with that of *Gleichenia*, in order to illustrate the association in the same Cretaceous beds of general types which have since established themselves in different parts of the world. As in almost all Arctic countries, where Jurassic, Cretaceous, and Tertiary plants have been collected, so also in Greenland leaves of *Ginkgo* are abundant. The living species, *Ginkgo biloba*, is believed to be extinct as a wild tree, but it is widely spread in the Far East, where it is regarded as a sacred plant. It occasionally flowers in England, though much more freely in the south of France. Conifers are among the commonest plants in the Greenland rocks; the short, linear leaves of one species, which often occur in profusion in beds of shale, exhibit a close agreement in structure to the grooved needles of the Umbrella Pine of Japan, *Sciadopitys verticillata*. Others, represented by foliage-shoots and cones, are nearly allied to the Sequoias of California.

* The distribution of *Gleichenia* is reproduced from a map published in the *Journal of the Linnean Society*, vol. xlvii., Pl. XVI., 1922. (The Hooker Lecture: "A Study in Contrasts," A. C. SEWARD.)



Among the numerous species of Dicotyledons are some which it has been customary to refer to the genus *Liriodendron*, now represented by the Tulip-tree of North America and China. A recent examination of specimens of these simple, emarginate "leaves" has convinced me that they are the leaflets of a compound leaf, a conclusion which had previously been reached by some other palæobotanists who have examined specimens from North American and European Cretaceous rocks. In a recently published book on "Tree Ancestors," the American palæobotanist, Mr. E. W. BERRY, speaks of the occurrence of *Liriodendron* in Greenland, but I venture to think that there is no satisfactory evidence in support of this statement. Though it is not possible from the available material to refer the leaflets to any one recent genus with complete confidence, the probability is that they belong to compound leaves of a plant closely allied to some existing species of *Dalbergia* or possibly *Pterocarpus*, genera with a wide geographical distribution in the tropics and both occupying a similar position in the Leguminosae. Other Greenland Cretaceous Dicotyledons I hope to describe in a forthcoming account of the flora as a whole. Enough has been said to emphasize the contrast between the vegetation of the Arctic regions in the Cretaceous period and that which now characterizes the ice-free fringe of Greenland.

The Arctic Tertiary floras, especially that which has been disinterred from the Greenland strata, demonstrate with equal clearness the former occurrence, in high northern latitudes, of types which are now met with in much more southern localities. To meet the difficulty of explaining the wide difference between the climatic conditions of the past and those of the present geologists have often advocated a shifting of the axis of the earth, a step which does not commend itself to astronomers. There is no adequate reason for assuming any alteration in the position of the earth's axis—large enough to account for the lowering of temperature since the early days of the Tertiary period—since that remote stage of geological history when terrestrial vegetation first became established on the earth's surface. Moreover, if by postulating a shifting pole we make it easier to explain the occurrence of a luxuriant flora in one part of a circumpolar continent, new problems are presented in other places. It is reasonable to assume that in former ages, as at present, the vegetation within the Arctic Circle experienced a long quiescent period during the winter months, and there are no grounds for suspecting that a protracted annual rest would be injurious to a type of vegetation such as the fossil record has disclosed. The present glacial state of Greenland and other Arctic lands may represent an exceptional phase of earth history. Changes in the distribution of land and water, a more ample supply of warm water from southern seas, a more efficient outlet for colder water from the polar ocean, and a continent of lower elevation than the Greenland plateau of to-day might produce the necessary amelioration of climate.

One of the obvious questions raised by the investigation of any collection of fossil plants is, can we form an opinion on the climatic conditions in which they grew? In other words, what is the value of plants as tests of climate? The members of the older geological floras are too far removed from all living species to furnish a satisfactory clue to temperature. We have, however, seen that in the Devonian period the Arctic vegetation included well-developed arborescent species which, so far as we can see, exhibit no sign of an environment comparable to that in the same regions to-day. Many petrified stems of Coniferous trees have been described from rocks of different ages within the Arctic Circle, and all of them agree much more closely in structure with those of trees which now inhabit temperate or more southern latitudes than with the stems of modern Arctic trees. We collected several specimens of large coniferous stems in West Greenland greatly exceeding in diameter and in the breadth of the well-marked annual rings even the largest stems of the stunted trees which exist to-day. Most of our material was no doubt derived from Cretaceous rocks, but a large stem found on Hare Island (slightly north of lat. 70° N.) is probably of Tertiary age. The abundance of logs of wood on the beach of the west coast, drifted from northern Siberia and elsewhere, suggests the possibility that some of the fossil stems may have been carried by currents from other regions.

The narrowness of the annual rings, of which there may be over one hundred in a stem an inch in diameter, is one of the more striking features of the few arborescent plants that now occur in high latitudes. It is not always easy to detect any clearly marked rings of growth in Arctic trees or shrubs; this is shown by the descriptions of Greenland plants by Prof. WARMING* and his collaborators. The sharp contrast between the short season of concentrated growth and the long period of rest is not invariably registered in the minute structure of the wood. This is a fact of importance in relation to the general question of the value of rings as evidence of climate. The usual view is that the alteration of seasons is reflected in the sharply defined contrast between the wood formed in the late summer and that produced in the following spring, when the opening buds make large demands on the water-conducting channels. While it is safe to assume some connexion between seasonal rhythm and rings of growth, an investigation of stems of many Dicotyledons and Conifers has led the Swedish botanist, Dr. ANTEVS,† to the conclusion that rings cannot be accepted as trustworthy guides to conditions of life. Plants differ constitutionally from one another; they respond in different degrees to the influence of the environment, and trees grown under identical conditions exhibit great differences in the definition of the rings.

The estimates of mean temperature in past ages given by authors are based on the assumption that an association of plants composed

* *The Structure and Biology of Arctic Flowering Plants.* Copenhagen, 1908.

† *Progressus rei botanicae.* 1917.

of individuals closely allied to recent species required approximately the same conditions. The key of the past is often said to be supplied by the present; but if we examine more critically the evidence furnished by plants of the present day we realize that there is a danger of overestimating the value of results obtained by a comparison of extinct and living species. The genus *Gleichenia* is mainly tropical in its distribution; but it extends as far south as the Straits of Magellan, the Falkland Islands, and the South Island of New Zealand; it is recorded from north of lat. 30° N. in the Far East, and it flourishes at an altitude of over 12,000 feet in New Guinea and over 10,000 feet on Ruwenzori. The genus is represented by species able to live under very different climatic conditions. Even some of the species of Arctic plants, as we have seen, have a remarkably wide range and can adapt themselves to dissimilar circumstances. A genus may now be represented by species which are for the most part attuned to tropical habitats, but it may also include others adapted to cooler situations. A study of ancient floras reveals the capacity of plants as travellers; many flowering plants, conifers, and ferns that are now confined, or almost confined, to the tropics of the southern hemisphere were in the Cretaceous and Tertiary periods represented by species widely spread over the northern hemisphere, passing far within the Arctic Circle. I imagine that changes in climate were responsible for a southward migration. The evolution of new and more vigorous types may have had a share in causing the older plants to evacuate their northern homes. Climatic changes have undoubtedly occurred; the mean temperature of Arctic lands must have been higher than it is now; but in all probability the contrast has been exaggerated. I need not point out that closely allied species often differ considerably in their resisting power to adverse climatic conditions. We are not justified in assuming that a Cretaceous species, which bears a close resemblance to a living species in morphological characters, resembled it equally in its manner of response to external factors.

Horticulturists can render valuable aid to those of us who try to reconstruct the plant-world of other days; we want to know more about the constitutional peculiarities of nearly related species, and further information is needed on the subject of acclimatization—the capacity of a plant to adapt itself to a climate less genial than that of its native place. Plants within certain limits are trustworthy guides to climatic fluctuations; but the point I would make is that their value is less than has usually been assumed. A plant's success is due to many causes; the secret which we most desire to discover is at present hidden in the complex structure of the living cells. Form and structure are in different degrees moulded by the circumstances of the habitat; but it is from the protoplasm within the cells that the motive power is supplied. The plasticity of plants is shown by range in habit, in the form and structure of the several parts; but unless the living basis of life is able to function the

mechanism ceases to act. We speak of living protoplasm in all members of the vegetable kingdom as the same substance ; so far as I know, we cannot distinguish the protoplasm of a plant on the peak of an ice-bound mountain from that of a dweller in the tropics. We believe that there is a difference ; to discover in what this difference consists is a problem which is still unsolved.

AUTUMN COLOURING OF PEAR FOLIAGE.

By A. N. RAWES and J. WILSON.

HERE and there in England gardens have been planted with a special eye to beauty in autumn, and care has been taken to select and group trees and shrubs having peculiar claims to beauty at that season either in colour of foliage or of stem, or in profusion and brilliancy of fruit. Some of these trees and shrubs have more than one season of beauty, but few are of value in the garden except for their loveliness. Yet this need not be, as indeed more than one great gardener realized long ago, among them the late Secretary of our Society, the Rev. W. WILKS, who used pear trees with excellent effect on his lawn, and with discriminating taste both in the nature of the fruit and in the colouring effects the trees produced.

In order to enable others to combine use with beauty in their planting we have kept notes upon the behaviour of the varieties of pears in our collection at Wisley. The hillside on which they grow in the strongest soil in the garden has been a very attractive feature in autumn for many years, when the foliage has turned from the deep green of summer to the brown and yellow and scarlet of autumn.

Not every season gives the same good colours, and it is by no means easy to see what the conditions are that lead to their greatest production. The colours were good in 1921 and 1923, and perhaps even better in 1922, while 1924 saw a falling off in brilliance, but one or two facts seem to emerge.

1. Colouring of foliage in autumn is a varietal characteristic. The shades of colour produced by any one variety are approximately the same each season unless interfered with by weather.
2. The less freely the tree is growing the more pronounced the colouring.
3. The older the tree the more likely is the colour to be well developed.

It is probable that the stock has some influence, but our knowledge of the stocks used for many of the pears in the collection is vague, since they were nearly all propagated elsewhere. The colours are usually at their best from about the middle of October to the first week of November, but the time of leaf-fall varies considerably and their beauty may last longer.

The most consistently brilliant in their autumn tints for the past seven years have been: 'Beurré Jean van Geert' (bright red with a yellowish tinge); 'Colmar d'Été' (deep red, but poor in 1924); 'Durondeau' (deep reddish-brown); 'Fertility' (rich crimson, poor in 1924); 'Passe Colmar' (red); 'Souvenir du Congrès' (rich crimson); 'Thompson's' (deep rich red); 'Triomphe de Vienne' (crimson, poor in 1924).

Rather less consistent in production of colour, but often very beautiful, are: 'Bergamotte d'Heimbürg' (deep red); 'Beurré de l'Assumption' (red, turning dark brown); 'Beurré Capiaumont' (reddish); 'Beurré Clairgeau' (yellow-red); 'Beurré de Jonghe' (bright red); 'Beurré Rance' (yellow or orange, turning black); 'Beurré Sterkmanns' (red and yellow, turning brown); 'Beurré Superfin' (yellow); 'Directeur Hardy' (pinkish-red, turning yellow); 'Emile d'Heyst' (reddish-yellow); 'Huyshe's Victoria' (orange-red); 'Michaelmas' (scarlet); 'Napoleon' (reddish-yellow); 'Olivier de Serres' (reddish-brown); 'Princess' (dark red); 'Triomphe de Jodoigne' (yellow); 'Zephirin Grégoire' (dark red).

Other varieties have been noted as good only in one or at most two years out of seven, and these might roughly be grouped as follows:

Bright Red or Crimson.

'Grosse Calebasse,' 'Marguerite Marrillat,' 'Williams' Bon Chrétien,' 'Calebasse Bosc,' 'Fondante d'Automne,' 'Marie Benoist,' 'Danas' Hovey.'

Reddish-Brown or Bronze.

'Belle Julie,' 'Girogile,' 'Magnate,' 'King Edward,' 'Nec Plus Meuris.'

Reddish-Yellow or Orange.

'Bellissime d'Hiver,' 'Van Mons' Léon le Clerc,' 'Beurré Hardy,' 'Fondante de Thirriott,' 'Baronne de Mello,' 'Conference,' 'Beurré d'Anjou,' 'Comte de Lamy,' 'Zoe,' 'Parrot,' 'Fondante de Cuerne.'

Yellow.

'Josephine de Malines,' 'Knight's Monarch,' 'Marquis,' 'Beurré Baltet Père,' 'Brockworth Park,' 'Beurré Mortillet,' 'Catillac,' 'Bergamotte d'Esperen,' 'Belle Guérandaïse,' 'Jargonelle,' 'Beurré Fouqueray.'

Of the remaining varieties in the collection, most have rather drab and unattractive autumn colouring. They may be grouped as follows:

Brown-Yellow.

'Beurré Diel,' 'Pitmaston Duchess,' 'Beurré Dumont,' 'Doyenne d'Alençon,' 'Hacon's Incomparable,' 'General Todelben,' 'Mme. Treyve,' 'Maréchal de la Cour,' 'Dr. Jules Guyot,' 'Beurré d'Amanlis,' 'Cansell's Bergamotte,' 'Doyenne Bussoch,' 'Grégoire Bourdillon.'

Brown.

'Glou Morceau,' 'Marie Louise,' 'Président Barabé,' 'Uvedale's St. Germain,' 'Charles Ernest.'

Greenish-Brown.

'Beurré d'Avalon,' 'Beurré Bachelier,' 'Beurré d'Arenberg,' 'Clapp's Favourite,' 'Duchesse de Bordeaux,' 'Hessle,' 'Beurré Brown.'

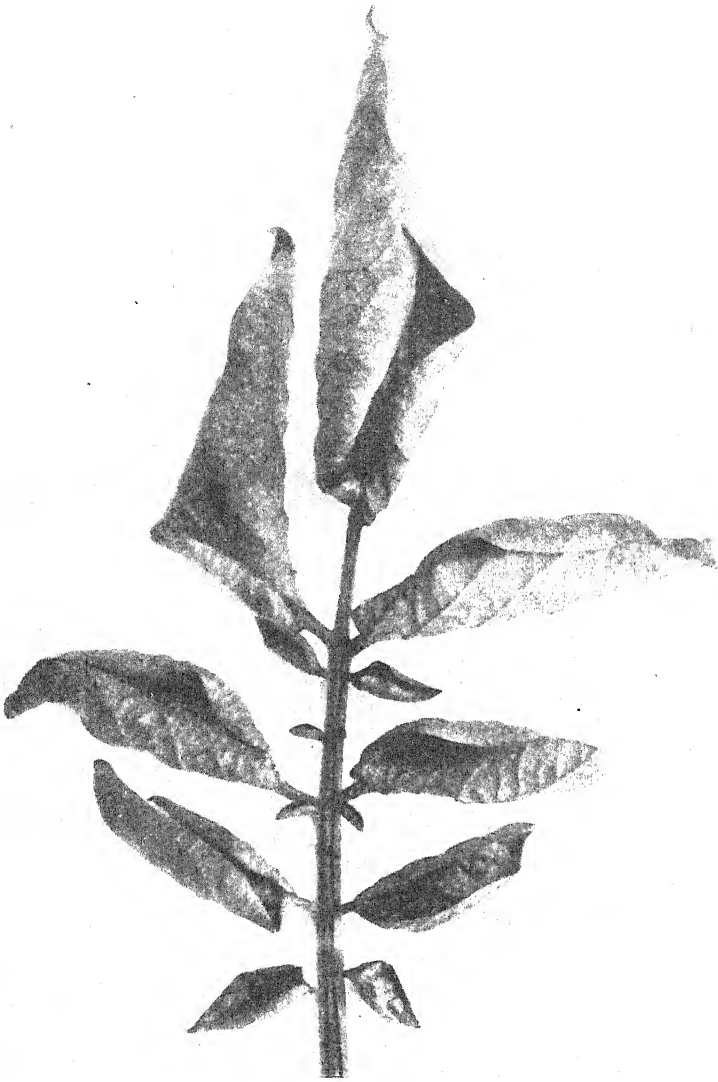


FIG. 1.—POTATO LEAF ROLL.
A typical example of the basal leaf of an affected plant.



FIG. 2.—POTATO LEAF ROLL.
The top leaves of a badly affected plant.

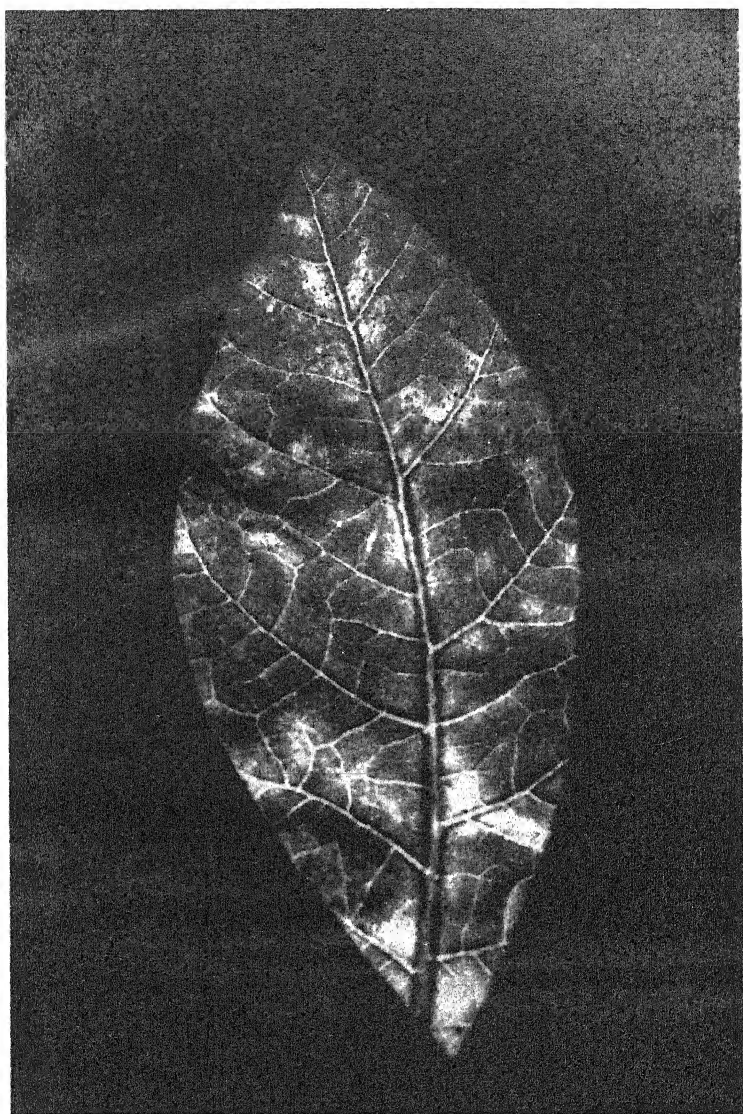


FIG. 3.—MOSAIC DISEASE OF POTATO.
Part of a leaflet of Potato affected with Mosaic Disease.
Photographed by transmitted light,



FIG. 4.—MOSAIC DISEASE OF POTATO.
Showing the contrast between a diseased (on left) and a healthy plant (on right).

[To face p. 21.

THE RELATION OF LEAF AND OTHER DISEASES OF THE POTATO TO THE CROP.

By DAVID C. CUTHBERTSON.

AT the present time the subject of my paper is being assiduously studied by a great many of the leading pathologists and mycologists at most of the agricultural and horticultural institutions throughout the world. It is a subject which is also compelling the attention of all the progressive practical agriculturists throughout the country.

The reason for this ubiquitous interest is not difficult to seek, for at the present time the potato crop seems to be subject to a greater number of diseases than at any time since its introduction into cultivation, some three hundred years ago.

I cannot say whether the plant has become more susceptible to disease, or whether more diseases have arisen. Possibly neither of these explanations is correct, and it may be that the potato during recent years has commanded such an amount of attention that we have become more observant and more alive to the evils that are with us.

It is certain, however, that many of the potato diseases are of such an alarming character, either actually or potentially, that thorough investigation is imperative and critical.

Such an investigation lies strictly within the domain of science, but close co-operation with the practical is not only desirable but essential. It is impossible for the man of science to confer with the practical man, however, unless the practical man is considering the subject from an intelligent and thoughtful point of view.

I am afraid that the average farmer is not conversant with many of the most serious diseases at present threatening the productivity of his potato crop, simply because he has little information that is of a nature which he can understand and easily assimilate. So, perhaps, I may be excused for dealing with a scientific subject as a purely practical man, and from an empirical point of view.

It is my intention to divide my paper into three sections: the first dealing with the two "virus diseases" known as Leaf Roll and Mosaic; the second dealing more particularly with diseases affecting the tuber, for example, Blight, Wart Disease, Corky Scab, Common Scab, Rhizoctonia, and Sprain; the third dealing with "Wild" types.

1. Neither Leaf Roll nor Mosaic causes any decay of the tuber, or any noticeable premature decay of the plant, but both affect the growth of the plant to a very considerable extent.

In Leaf Roll it appears that the direct result of the disease is that, although a certain amount of starch is made by the plant, the

starch is not transported to the tubers and the leaves become congested with starch. The result of this condition is, of course, a much reduced crop, as tubers cannot be made without starch. The leaves themselves become hard and brittle and roll inwards, and generally present a very unhealthy appearance.

Mosaic disease takes its name, I imagine, from the fact that the leaves of the plant are affected in such a way as to show a kind of mosaic pattern of yellow and green colours, especially when viewed by transmitted light. The disease is not difficult to recognize in severe cases, as will be seen from the figures. It appears that in Mosaic there is an interference with the chlorophyll—that is, the green colouring matter of the plant—and, as the presence of the chlorophyll is necessary before the manufacture of starch can take place, the result to the crop is much the same as in the case of Leaf Roll.

Both diseases spread rapidly, and it seems that some particular type of aphid is responsible, in the main at least, for transmitting the infection.

Whether the diseases are contagious or not has yet, I think, to be proved. Much experimental work in this line is at present being carried on.

Generally speaking, the farther north you go, and also the higher you go, the more free will the crops be found from these virus diseases.

There is no preventive or curative means known yet, and no variety in commerce is completely immune.

Plants from clean seed from Scotland can be infected in the south of England in one season, and if seed from that crop be saved and planted again the resultant crop may be reduced in yield by 25 per cent. This astounding fact was first emphasized by COTTON, now of Kew, in the years immediately following the war.

My own experience shows that crops infested with either Leaf Roll or Mosaic tend to get worse and worse, and that in the end must become quite unprofitable. This, I know, is disputed, some holding that certain varieties may only reach to a definite stage and remain there, such as 'Golden Wonder' and 'Burnhouse Beauty,' both 100 per cent. Mosaic. I agree that in Scotland it might be possible to keep the disease at a certain stage, but I feel sure that in the milder climate of England rapid degeneration is bound to take place.

It is often thought that a variety deteriorates or degenerates in the south simply because it is propagated year after year in the same climate from the same stock. By very careful observation and investigation it has been proved that this is not the case. Purely physiological deterioration is of very minor importance. Deterioration is due almost entirely to the presence of virus diseases.

2. I do not propose to say much here of diseases which affect more particularly the tuber, as the figures will be self-explanatory. I should just like to say a word about Blight however. This disease has been very prevalent in Scotland this year (1924), and farmers in

that country know only too well the relation which Blight has to the crop. In many districts it will reduce it by 50 per cent., a very serious relationship.

There is still a great deal to be learned about the disease, and it is gratifying to know that much research work is at present being carried on. Spraying is only partially effective as a preventive, especially in such a season as we have experienced this year. I have seen a crop which was diseased to the extent of at least 30 per cent., despite the fact that it was carefully sprayed five times. An idea prevails that once the disease shows on the leaves it will travel down through the plant and so on to the tubers. This is quite an erroneous supposition. The spores of the disease are washed off the leaves and down through the soil on to the tubers, and thus the tubers get attacked with *Phytophthora*.

3. Wildings are plants which seem to have reverted, partially at least, to the original types of the *Solanum*. I do not know whether it is correct to say that the plants are diseased, but at any rate the reversion is of a distinctly degenerative nature. Figure 12 will show clearly what a detrimental effect they have on the crop.

The figures which accompany this paper are made from actual specimens which I have photographed this year.

LEAF ROLL.

As far back as the eighteenth century this disease seems to have been observed, but until quite recently it was known as "Leaf Curl." The old name has been dropped, however, in favour of the new one, and "Leaf Roll" is the accepted designation of the disease throughout the world.

Fig. 1 shows clearly the effect that this virus disease produces on the leaves of the plant. The edges of the leaflets roll inwards towards the midrib, and so an almost tubular shape is produced. In the early stages of the disease the rolling of the leaflets is only noticeable on the basal leaves; later on, however, the whole plant becomes affected and fig. 2 shows the topmost leaves in a severe case.

When attempting to remove plants affected with Leaf Roll from a stock growing for seed purposes, it will be realized how essential it is to examine the basal leaves, as even in this stage the disease causes considerable loss. Seed tubers saved from slightly affected plants will all be infected, and a further and more marked deterioration will be observed the following year.

To save seed tubers from a plant when it has reached to a stage as bad as that depicted by fig. 2 would be foolish in the extreme, as it is questionable whether any crop at all would be produced the following season. Fig. 5 shows the relation which Leaf Roll has to the crop, but further comment will be made on this after dealing with the other virus disease known as "Mosaic."

MOSAIC.

In the early stages Mosaic disease is not so easily recognizable as Leaf Roll, but it is none the less serious, and it should be the aim of all growers to become familiar with it. When a leaflet is taken and looked at against a sheet of white paper or held up against a bright light, the mosaic pattern of yellowish-green and green colours will be seen at once. Fig. 3 shows the effect of a leaflet photographed by transmitted light. Where the chlorophyll is lacking the light has been able to pass through the leaflet and, of course, shows up white in the photograph. The green parts of the leaflet have, however, stopped the passage of light and these show up black.

Coupled with the mosaic effect produced there is often a marked crinkling of the leaflet and a waviness of its outline.

Fig. 4 gives a clear impression of the appearance of a stem affected with Mosaic, and, for comparison, a normal healthy stem has been photographed alongside it on the right. It will be appreciated at once how distinctly unhealthy the Mosaic affected plant appears.

Just as is the case in Leaf Roll, the tubers at the root of a Mosaic diseased plant are infected, and if planted will show a greater degree of degeneration. In fact, in a very few years—two or three at the most—if tubers are planted which were saved from a plant badly affected in the first case and the produce of each year saved and planted, a very small and excessively diseased plant will result. At this stage the disease is sometimes known as "Curly Dwarf." It is the last stage, of course, for such a plant will produce no tubers.

Fig. 5 illustrates more clearly than words can do the truth concerning the serious and detrimental effect which the virus diseases Leaf Roll and Mosaic have on the crop.

On the left there is a plant, exactly as lifted, affected with Leaf Roll, on the right one affected with Mosaic, and in the centre a normal healthy plant. *All three plants are of the same variety.*

In the case of Leaf Roll it will be observed that only three or four tiny tubers have been produced. The one large tuber is the original seed-tuber which has remained in an undecayed state. The latter fact is very often a characteristic of Leaf Roll.

Where the plant has been affected with Mosaic, again it will be noticed that only a very poor crop has been produced, and also that the tubers are very small in size.

The normal healthy plant has produced a normal healthy crop of useful sized eating-potatoes. Now consider for a moment the effect on next year's crop if a field of potatoes, containing equal numbers of plant affected as shown in the illustration, was allowed to die down and harvested in the usual way. Sometime during the winter or spring months the farmer would dress over the clump of potatoes and the large ones would be sold for eating purposes and the small ones would be set aside for planting. At once it will be apparent that it is the tubers from healthy plants which are being sold for consumption,



FIG. 5.—ON LEFT : POTATO PLANT ATTACKED BY LEAF ROLL. MIDDLE : NORMAL PLANT OF THE SAME VARIETY.
ON RIGHT : THE SAME ATTACKED BY MOSAIC DISEASE.



FIG. 6.—THE EFFECTS OF BLIGHT ON SKIN AND FLESH OF POTATO TUBER.



FIG. 7.—INTERNAL DISEASE, OR SPRAIN, OF POTATO.



FIG. 8.—CORKY SCAB OF POTATO.

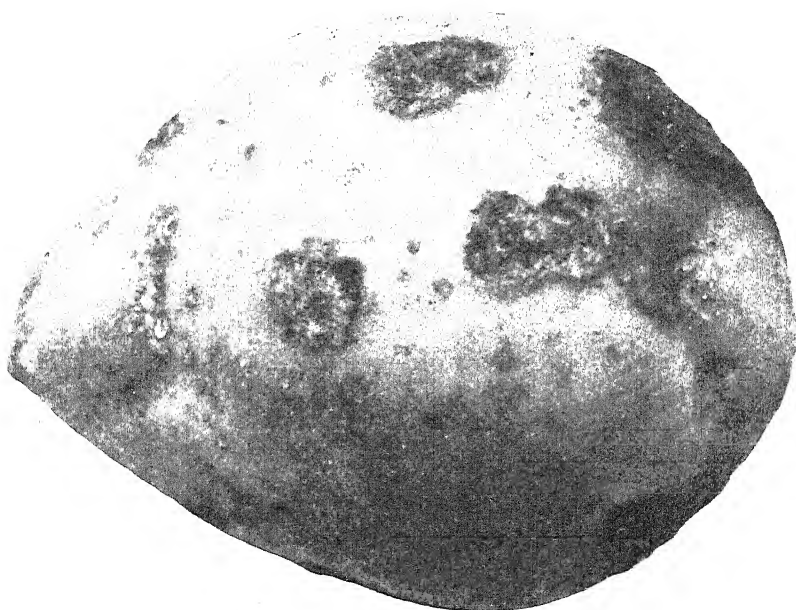


FIG. 9.—BROWN SCAB OF POTATO.



FIG. 10.—RHIZOCTONIA DISEASE OF POTATO.

whilst the unhealthy ones mixed up with the healthy small ones are being kept back for planting. In the case of the diseased plants there would be no tubers large enough for market purposes, consequently they would be all kept back, whilst in the case of the healthy plant only the small tubers would be saved for seed. Apart altogether therefore from infection being spread by green-fly, the percentage of disease is bound to increase unless steps be taken to grow crops for eating purposes and crops for seed on entirely different systems.

Some of the leading seed growers in Scotland have now become alive to this fact, and, more than altering their methods, they have almost exactly reversed them. In other words, they are using all the *large* tubers for planting, and discarding the small ones altogether.

This method, together with a vigorous roguing out of all diseased plants during the growing season, is, I feel sure, the only method of dealing with these virus diseases in the light of our present knowledge. Though an expensive method it is a common-sense one, for I think it has been clearly shown that, in most cases at any rate, large tubers are produced by healthy plants.

Unfortunately for the growers in the South, such a method of growing for seed does not bring about anything like the results that it does in Scotland. Conditions are different, and it seems to be impossible to check the spread of infection by aphid. Consequently plants which appear healthy this year will almost certainly show signs of disease the following year, due to these having been infected by green-fly during the previous growing season.

Altogether these virus diseases, Leaf Roll and Mosaic, constitute a very grave problem. With the possible exception of Blight, there is no trouble which is so seriously threatening the potato crop.

I will now pass on to a few of the diseases which affect more particularly the tubers themselves. I propose to say nothing about Wart disease and to show only one illustration of Blight. Both these diseases have been very fully dealt with by the Ministry of Agriculture, and all the available information is to be had in pamphlets issued by that department.

Fig. 6 shows very clearly the effect of Blight on the tuber. Nearly all the skin is of a leaden colour, and the diseased tissues of the flesh are rusty-red. At first the disease of the flesh will be confined to the area just underneath the skin, but gradually it will penetrate deeper and deeper until the whole tuber is destroyed.

Diseased tubers, even although only slightly diseased, should never be used for seed purposes.

CORKY SCAB.

This is caused by a parasitic organism. At first only a small swelling or pimple appears on the skin of the tuber, but after a time as the irritation increases these swellings burst and the brown powdery spores are released. Fig. 8 shows the disease in its earlier stages

some time after the swellings have burst. The scabs so formed are usually filled with the brown powdery spores which I have just mentioned.

It is characteristic of Corky Scab to attack second growth more severely than the first-formed tuber, due, I imagine, to the fact that the skin of the "second-growth" tuber is so tender. It will be observed in fig. 11 that the little outgrowth at the end of the main tuber is almost completely covered with Corky Scab. In such a case the flesh as well as the skin of the tuber is damaged.

If this disease is very prevalent it is a good plan to give the ground a long rest from potatoes. Corky Scab is not known to attack any other crop, consequently if potatoes are not planted for some years it may be possible in this way to kill out the parasite.

COMMON, OR BROWN, SCAB.

This is a much more common but less serious type of scab than Corky Scab.

Apart from its unsightly appearance it does not cause any injury to the tubers.

For a long time it was thought that Common Scab was brought about by a mechanical irritation of the skin due to causes such as sharp flints in the soil. Recent investigation has proved this supposition to be wrong.

Common, or Brown, Scab is caused by a fungus. This fungus seems to thrive in soils which have an excess of sand, lime, ashes, soot, or which are alkaline from other causes. Fig. 9 illustrates the appearance of these scabs. Sometimes the scabs are very small and sometimes they may all be joined up and so cover the entire surface of the skin.

Green manuring greatly helps to prevent the fungus from attacking the tubers, as apparently if plenty of organic matter is at hand the fungus prefers this to the potato.

It is not advisable to plant badly scabbed seed, as this might tend to infect the soil and so produce scab on the new crop.

RHIZOCTONIA SOLANI.

This is a disease which, though not at all serious, is widespread in many districts. The little black spots which stand out from the skin seem to be caused by a fungus. Although adhering tightly to the skin of the tuber they can be picked off with the finger-nail. Sometimes when these black masses collect in the eye of the potato damage is done and the tuber may fail to sprout, or at least only produce a weak shoot, otherwise the disease does not appear to affect the tuber in any way. Fig. 10 shows a tuber of Golden Wonder well covered with *Rhizoctonia*.

SPRAIN.

This is a disease about which little is known. I am told that it is caused by some bacterial parasite, but little information is to hand at the moment from the research workers.

The effect of Sprain is clearly shown in fig. 7. This is a severe case. In mild cases small patches of discoloured tissue may be found in different parts of the flesh. The tuber appears to be sound, but of course when cut the diseased portions are at once discovered. Tubers affected are of no use for cooking purposes.

No control means are known, but it is not advisable to plant affected seed if this can be avoided.

WILDINGS.

Wildings are types of plants which only recently have drawn attention to themselves. I cannot say whether they are produced by disease or whether they are reversions to the wild types of *Solanum tuberosum*. At any rate they are of a distinctly degenerate nature and should be removed from all stocks. Fig. 12 gives a good impression of what a wilding plant looks like. The enormous number of stems and the equally large number of small potatoes will be realized when comparison is made with the normal healthy plant shown on the left-hand side of the illustration. With the normal type of sorting generally adopted by farmers throughout the country, it will be seen at once that all the produce from the wilding plant will go for seed, and that in consequence the percentage of wild plants must increase. It is very necessary, therefore, that all such plants be removed from crops, more particularly from those crops which are being grown for seed.

In conclusion I should like to express my indebtedness and gratitude to the many scientific and practical workers who are endeavouring to find the cause and perhaps the remedy for the many distressing potato problems of to-day. They have been ever ready to help me, and but for their knowledge mine must have been valueless. I should also like to express my thanks to the Board of Agriculture for Scotland—Mr. ANDERSON, their scientific adviser, in particular—for the many kindnesses they have extended to me, and for the many ways in which they have helped me to collect data for this paper.

APHIDES ATTACKING VEGETABLES AND MARKET-GARDEN CROPS.

By FRED. V. THEOBALD, M.A., F.E.S.

INTRODUCTORY NOTE.

A NUMBER of Plant Lice or Aphides may be found from time to time feeding on vegetables and market-garden crops. Whilst some of these are only of occasional or local importance, others are more or less general pests, and must be regarded by gardeners and market growers as of considerable importance. This especially applies to the Mealy Cabbage Aphis (*Brevicoryne brassicae*); the Black Fly (*Aphis rumicis*) on beans; the Lettuce Aphides (*Amphorophora lactucae*, etc.); and the Plant Lice attacking cucumber and melons under glass (*Aphis gossypii*, etc.). In the following pages reference is made to these and to others found now and again. The measures of control are in most cases very similar, but where any special feature is prominent it is referred to.

A. *Attacking Peas and Beans.*

1. Green Pea Aphis (*Macrosiphum pisi* Kalt.).
2. Black Fly (*Aphis rumicis* Linn.).
3. French Bean Root Aphis (*Geoica phaseoli* Pass.).
4. Green Rose and Potato Aphis (*Macrosiphum solanifolii* Ash.).

B. *Attacking Potatos.*

1. Green Potato and Rose Aphis (*Macrosiphum solanifolii* Ash.).
2. Potato Myzus (*Myzus pseudosolani* Theob.).
3. Green Peach Aphis (*Myzus persicae* Sulz.).
4. Small Potato Aphis (*Aphis solanina* Pass.).

C. *Attacking Carrots.*

1. Root and Bulb Aphis (*Anuraphis tulipae* Boyer.).
2. Carrot Aphis (*Anuraphis dauci* Fab.).
3. Parsnip Root Aphis (*Anuraphis subterraneus* Walker.).
4. Willow Aphis (*Cavariella capreae* Fab.).
5. Parsnip and Willow Aphis (*C. pastinaceae* Sch.).

D. *Attacking Brassicas.*

1. Mealy Cabbage Aphis (*Brevicoryne brassicae* Linn.).
2. Green Peach Aphis (*Myzus persicae* Sulz.).
3. Green Potato and Rose Aphis (*Macrosiphum solanifolii* Ash.).

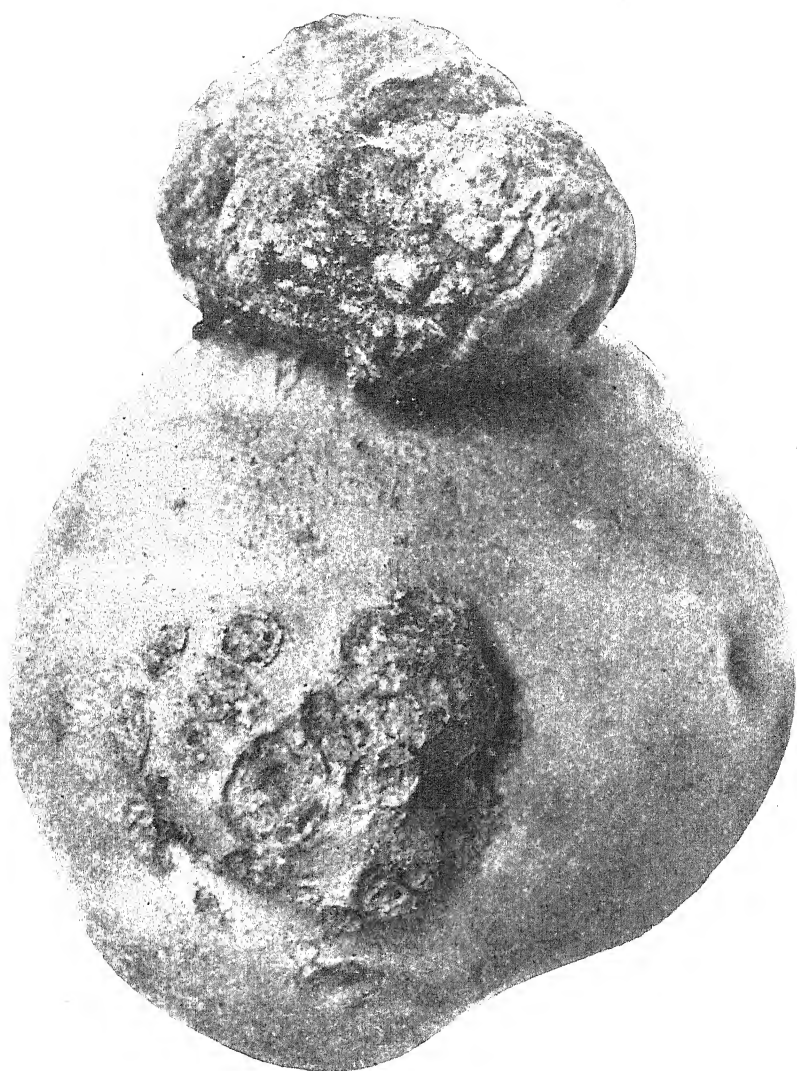


FIG. II.—CORKY SCAB OF POTATO.

[To face p. 28.]



FIG. 12.—ON LEFT: A NORMAL HEALTHY PLANT. ON RIGHT: A 'WILDING' OF THE SAME VARIETY.



FIG. 13.—*APHIS RUMICIS* ON CHAMOMILE.

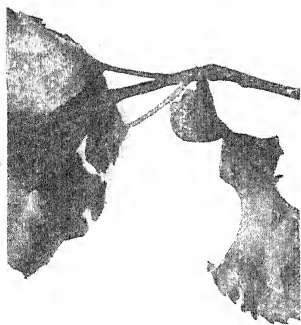


FIG. 14.—GALL OF *PEMPHIGUS BURSARIUS* ON POPLAR.

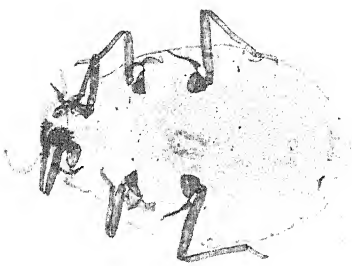


FIG. 15.—*PEMPHIGUS BURSARIUS*.

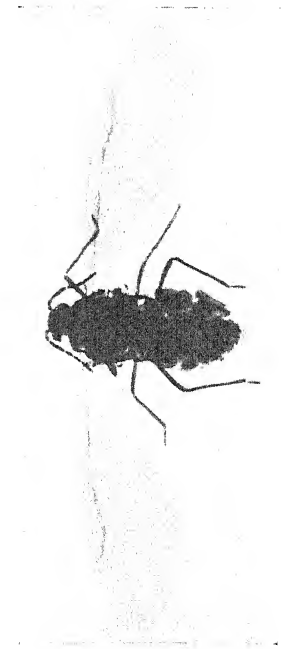


FIG. 16.—*PEMPHIGUS BURSARIUS* FROM POPLAR.

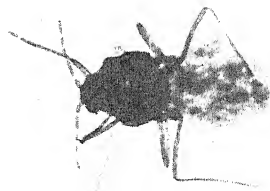


FIG. 17.—*PEMPHIGUS BURSARIUS* FROM LETTUCE (*lactucarius*).



FIG. 18.—CARROT SPLIT BY ANURAPHIS TULIPAE.



FIG. 19.—ANURAPHIS TULIPAE.

E. *Attacking Lettuces.*

1. Currant and Lettuce Aphis (*Amphorophora lactucae* Kalt.).
2. Small Currant and Lettuce Aphis (*Myzus lactucae* Schr.).
3. Sow-thistle Aphis (*Macrosiphum sonchi* Linn.).
4. Lettuce Root and Poplar Aphis (*Pemphigus bursarius* Linn.).
5. Green Potato and Rose Aphis (*Macrosiphum solanifolii* Ash.).

F. *Attacking Celery.*

1. Small Celery Aphis (*Aphis apii* Theob.).
2. Willow and Umbellifer Aphis (*Cavariella capreae* Fab.).

G. *Attacking Cucumbers, Melons, and Marrows.*

1. The Cotton and Melon Aphis (*Aphis gossypii* Glover).
2. Green Peach Aphis (*Myzus persicae* Sulzer).
3. Green Potato and Rose Aphis (*Macrosiphum solanifolii* Ash.).

H. *Attacking Artichokes (Jerusalem and Globe).*

1. Artichoke Root Lice (*Trama troglodytes* Heyden, and *T. radidis* Kalt.).
2. Pale Ant Aphis (*Forda formicaria* Heyden).
3. Globe Artichoke Flower Aphis (*Anuraphis cynariella* Theob.).

I. *Attacking Beetroots, Beet Spinach, and Spinach.*

1. Black Fly (*Aphis rumicis* Linn.).
2. Green Chenopodium Aphis (*Hyalopterus atriplicis* Linn.).
3. Green Peach Aphis (*Myzus persicae* Sulzer).

A. ATTACKING PEAS AND BEANS.

I. THE GREEN PEA APHIS (*Macrosiphum pisi* Kaltenbach). A large Green Fly or Aphis (*Macrosiphum pisi*) is often very harmful to main-crop peas and sometimes attacks the broad bean. The same also occurs on sweet peas and on most papilionaceous plants; clovers, lucerne, and trefoils are often heavily infested. In America it is known as the Destructive Green Pea Louse. In certain seasons we find a few large green-winged females, with darker head and thorax, settled on the tops of the pea shoots. This generally occurs in late June or July. These winged females have flown from clovers, and soon commence to deposit living young, small green lice, which rapidly grow into the fat green apterous viviparous females. These wander about, and after a few days they commence to produce living young. Numerous generations of apterous females, and now and then alatae, go on appearing right into the autumn on the peas, when a winged brood is produced, and these fly off to clovers, etc., and there give rise to oviparous, or egg-laying, females, which are wingless. Later, on the peas a brood of winged males appear and also fly off to the clovers, etc., and fertilize

the egg-laying females, which then deposit one to three eggs, which remain on the clovers till the spring, when they hatch and the young give rise to the Queen Aphides, which produce many young asexually. These continue breeding until June, when they become alate females, which fly off to the peas and beans. Red clover is particularly attacked by this aphid. It also lives on everlasting peas (*Lathyrus* sp.) in gardens and hedgerows, and on these the sexual broods also occur. The Green Pea Aphides, when mature apterous females, and to some extent alate females, are very timid, and quickly fall if the bine is shaken. The *oviparous female* on clovers and *Lathyrus* is wingless and green; the *male* is winged.

The insects smother the tender tips of the peas and kill them; they also attack the flowers and even the young pods in bad attacks; the latter become curled and stunted.

Treatment.—When a bad attack is taking place on staked peas, much good has been done by shaking the insects off on to tarred boards; a feather brush has been used for this purpose by growers with much benefit, but it cannot be done with the dwarf varieties. Either spraying with soft soap and quassia or dusting with nicotine powder will also soon control this pest, if it is doing damage, especially aiming at the tender top growths, but shaking off on to the ground and trampling the plant lice is usually sufficient. In America, where peas are grown wider apart than in Britain, various contrivances are used for dragging between the rows to destroy the insects.

2. THE BLACK FLY, OR COLLIER (*Aphis rumicis* Linn.).—The Black Aphid, the so-called "Collier" or "Black Death," is in many years a great nuisance on broad beans, and it now and then in bad "blight" years infests runner and French beans; wax-pod beans are also attacked, and now and then peas. Unless dealt with at once, complete loss of crop may be the result. *Aphis rumicis* may be found on a great variety of other plants. It is frequent, and may do harm, on the fronds of asparagus; in bad years it infests the tips of onions, and may destroy the leaves, and is also harmful to spinach and beetroots. It occurs in masses on docks, on poppies, fever-fews, fumitory, shepherd's-purse, camomile (fig. 13), thistles, and on wild Chenopodium and Atriplex; in some years it invades mangolds and does much harm. It is especially beans that are attacked, notably broad beans.

The adult *apterous female* is black and dull, with paler legs and antennæ with dark markings; the young are deep green, and the nymphæ or pupæ which show wing-buds often have many white patches of a mealy substance.

The *winged female* is dark, almost black, but the body is really deep green with black bars; the cornicles are black and the legs have pale areas. The alate females settle on the tops of the broad beans just when they come into flower, and amongst the tender growths they at once produce living young; these soon grow into apterous viviparous black Aphides, which go on reproducing young until the

whole of the tops of the shoots, leaves, and stalks become smothered with a black mass. The insects secrete much honeydew, and this falls on to the leaves, blossom, and young pods below. The insects, if left alone, increase in certain years so rapidly that they spread downwards and get on to the young pods and ruin them. The honeydew that falls down also does much harm, at first specking the leaves with brown spots, and the whole plant may shrivel up and die. In the summer an alate brood appears on the beans, etc., and these fly to other plants. Many go to mangolds, spinach, wild chenopodiums, etc., and later in the autumn many go to the wild and cultivated *Euonymus* and docks. On the *Euonymus* and docks sexual Aphides occur, and the oviparous females deposit their eggs, which become black and shiny. Many also live through the winter as adults on the evergreen *Euonymus* in gardens. The young coming from ova on the docks (*Rumex*) and the wild and evergreen *Euonymus* develop several broods there in spring and then fly off to beans, poppies, etc., and so start the summer attack. It has also been found to oviposit on potatoes in Holland.

Treatment.—As this “blight” usually appears on a few broad beans here and there, and as from these primary colonies much of the blight spreads to the other beans, it is advisable to pinch off and crush all the struck tops. There is no doubt that ants spread this insect: the ants swarm over the colonies of Black Fly, and one can watch them carrying females away to the tops of other beans. As the alate migrants from *Euonymus*, *Rumex*, poppies, etc., always settle on the tender tops, as it is only there that their young can live, it is advisable to pinch off all the tops at the same time; perhaps this will result in fewer beans, but they will be better and of more uniform size. Some growers prefer spraying; if this is done the spray should contain six ounces of nicotine to the 100 gallons of soft-soap wash. Other growers have used quassia and soft soap only for the Black Fly and reported success. Sparrows take large numbers of the Aphides and many parasites prey upon them, but in bad years they do not control the pest.

3. THE FRENCH BEAN ROOT APHIS (*Geoica phaseoli* Passerini). This subterranean Plant Louse is often very abundant on the roots of French beans and wax-pods, and also occurs on scarlet-runners and now and then on potatoes.

The *apterous female* (fig. 20) lives entirely underground on the roots; it is more or less globular in form and of a bright yellowish-buff colour to almost white and lightly covered with meal; the small head is brown and the antennæ very short; the legs are pale ochreous-brown and rather short. When mature they are about $\frac{1}{16}$ th of an inch long. In the summer a winged brood now and then occurs and escapes from the soil. The alate female has the head black, the thorax black with pale areas, the abdomen dull brownish-orange, with a median-brown area of irregular form and hue; the apex of the body is dusky; the front legs black, except the apices of the femora; there are no visible cornicles and no prominent cauda. The alate females appear to place

their young on the soil. No sexual forms have been found. Attacked beans can be told by the plants flagging, especially in hot weather, and by their pale sickly hue.

Control.—When French beans, etc., are seen to be turning prematurely yellow and wilting, it is well to pull up one or two and examine

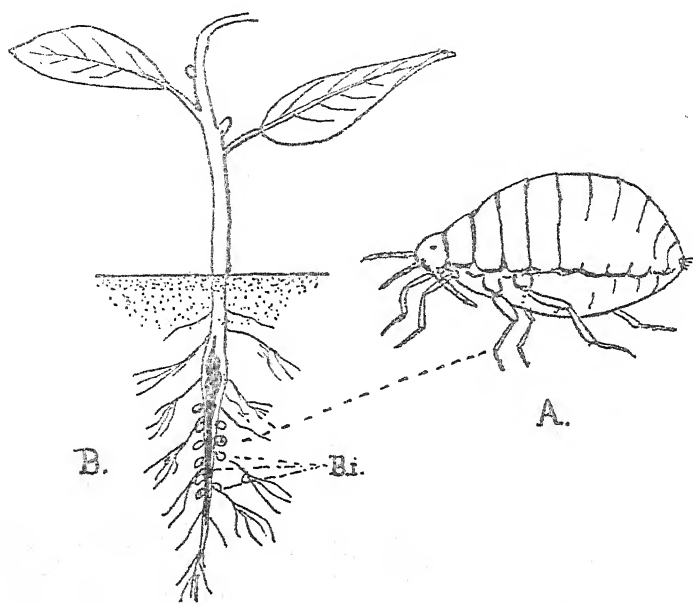


FIG. 20.—*GEOICA PHASEOLI*.

A. Adult apterous female. B. Attacked root. B.i. Apterous females.

the roots and soil; if Aphides are present they can soon be detected. Nothing can be done at that time that would pay, but as soon as the beans have been gathered the haulm should be pulled and burnt on the beds and the land dressed with naphthalene at 3 cwt. to the acre and dug in so as to prevent the alatae from attacking other plants.

B. POTATO APHIDES.

Four species of Plant Lice are found commonly feeding on the foliage of the potato, namely, the Green Potato and Rose Aphis (*Macrosiphum solanifolii* Ashmead); the Allied Potato Aphis (*Myzus pseudosolani* Theobald); the Green Peach Aphis (*Myzus persicae* Sulzer), and the Small Potato Aphis (*Aphis solanina* Passerini). *Geocica phaseoli* on rare occasions attacks the tubers, and sometimes the black *Aphis rumicis* is found on the haulm. The importance of these Plant Lice is not only that by their puncturing they damage the leaves, which in wet weather soon rot, but they are said to be the carriers of the "virus" diseases of potatoes. This appears to have been proved in America, and to some extent in Britain; the

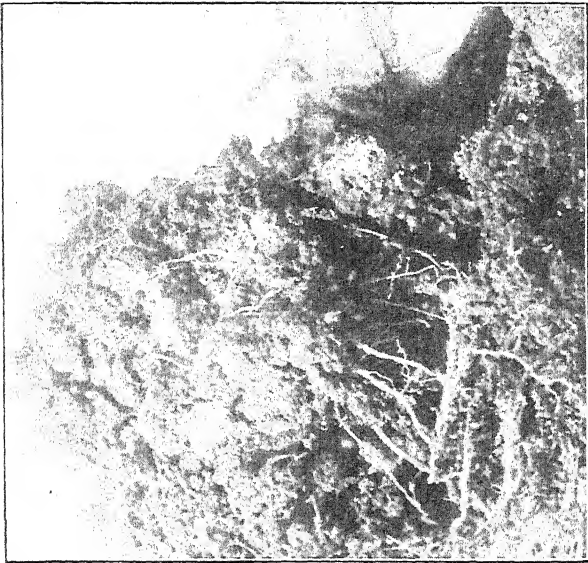


FIG. 21.—LETTUCE ROOT APHIS (*Pemphigus bursarius*).

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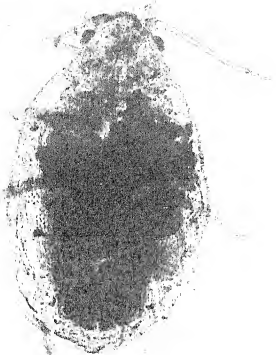


FIG. 22.—CAVARIELLA CAPREAE.
Apterous female, $\times 25$.

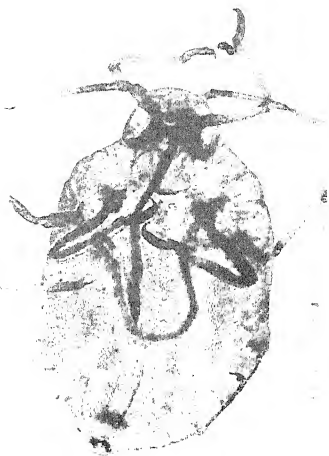


FIG. 23.—TRAMA RADICIS.
Apterous viviparous female.



FIG. 24.—CAVARIELLA CAPREAE.
Alate female, $\times 14$.

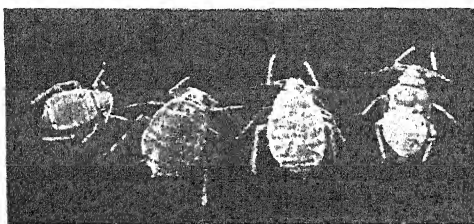


FIG. 25.—BREVICORYNE BRASSICAE.
Apterous females.



FIG. 26.—BREVICORYNE BRASSICAE.
Alate females.

writer is strongly inclined to think that Leaf Hoppers (*Typhlocyidae*) are as much implicated.

I. THE GREEN AND PINK POTATO AND ROSE APHIS (*Macrosiphum solanifolii* Ashmead).—This is the largest Aphis found on potatoes. The *apterous females* are green or pink, with long cylindrical green cornicles and long green pointed tail. The *alate females* (fig. 27) are green or pink, with darker head and thorax, long green cornicles, dusky at the tips, and long green cauda. The *male* is winged, with green and brown abdomen and dark head and thorax and brown legs. The *egg-laying female* is wingless, very pale, head and thorax very pale green to almost white, and the hind tibiae swollen. The sexuales occur on the rose, and a few on potatoes, and eggs are laid on them. In summer alate broods appear on roses and other plants, derived from the apterous

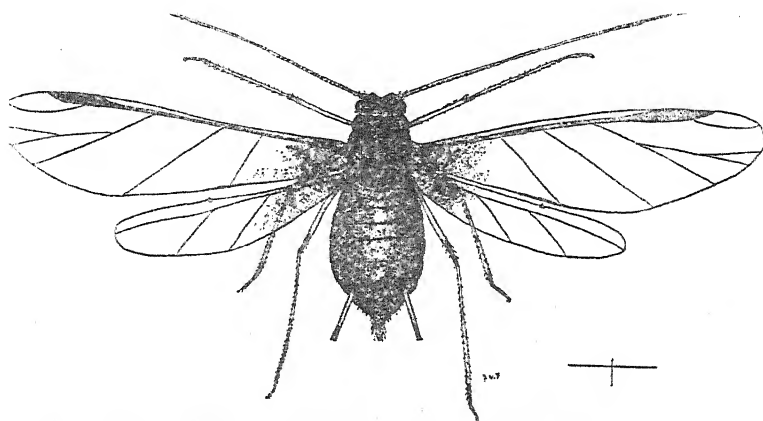


FIG. 27.—*MACROSIPHUM SOLANIFOLII*.

Alate viviparous female.

females that hatched from the winter eggs, and fly to the potatoes and join others that have matured from the ova laid on the potato at the time of lifting. This green Aphis occurs on many plants under glass all the year, and may especially be found on tulips; out of doors it occurs on roses, sow-thistles, Lactuca, Brassicas, French beans, etc. It never seems to be a serious pest on roses, but on potatoes and tulips may do much harm. Like other Aphides, it is usually present in small numbers, but in certain years it becomes very prevalent.

2. THE ALLIED GREEN POTATO APHIS (*Myzus pseudosolani* Theobald) is somewhat similar in the *apterous stage*, but the cauda is shorter and the head is of a very different shape. It is green, yellowish-green, or deep green, with rusty patches behind in some specimens; the green antennae have dark bands and the green cornicles are cylindrical. The *alate female* (fig. 28) is green and has dark transverse bars and lateral spots on the abdomen and a dark head and thorax; cornicles green, dusky at apices, and cylindrical; cauda green. It is

widely distributed over Britain, and often occurs in very great numbers. This insect attacks sprouting seed potatoes, often side by side with *Myzus persicae*. When this occurs on seed stored in outhouses and cellars, etc., it flourishes and does much harm by killing the sprouts, and

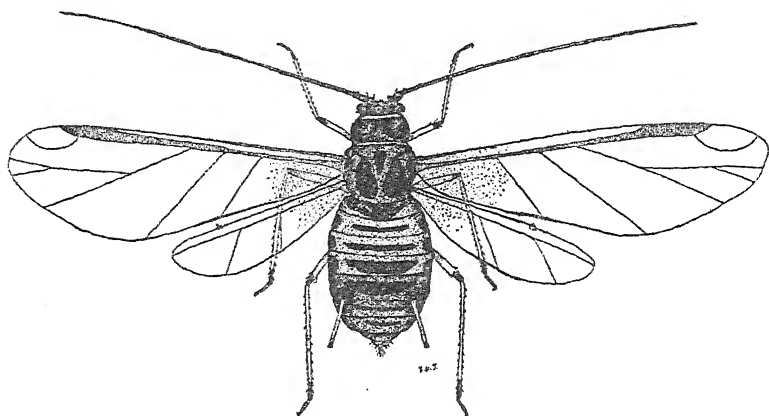


FIG. 28.—*MYZUS PSEUDOSOLANI*.

Alate viviparous female.

the seed shrivels up. If this seed is planted the Aphides die, but the seed produces a very much reduced crop. It also occurs with *persicae* and *solanifolii* out of doors and works in a similar manner. No sexual forms have so far been found.

3. THE GREEN PEACH APHIS (*Myzus persicae* Sulzer), a cosmopolitan insect, feeds in great numbers on the potato. It is found on almost all plants except the coniferæ and broad-leaved trees. It

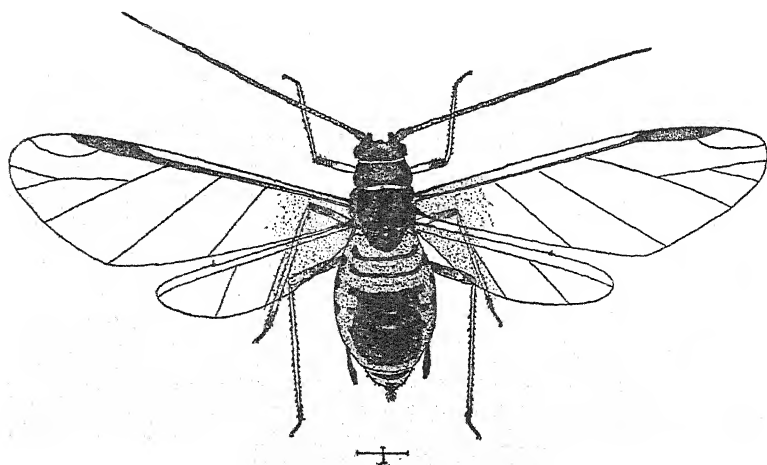


FIG. 29.—*MYZUS PERSICAE*.

Alate viviparous female.

can at once be told by the cornicles in the apteræ being to some extent swollen; this is also generally the case in the alatæ, but in the spring brood they may be cylindrical; in any case, they are dark and not green. The *apterous female* is green, yellow or pale brownish-pink; cornicles same colour as body, dusky at apices and slightly swollen in the middle. The *alate female* (fig. 29) is green with dark head and thorax and two dark bars on the front and with a large dark patch behind, and posterior to that some dark bars. Cornicles swollen in the summer and autumn forms, but now and then they are nearly cylindrical in the spring. The *egg-laying female* is apterous, salmon-pink or pale-reddish. Cornicles dusky, slightly swollen; hind tibiæ broadened. The *male* is alate and very much like the winged female, but smaller and with longer feelers.

This insect lives almost all the year round and may be found breeding at all times under glass and indoors. It is very important in that it is one of the two chief species that attack the sprouting seed, the other being *Myzus pseudosolanii*. It lives on most plants. The ova hatch as early as January. In most countries it is a serious peach pest.

4. THE SMALL POTATO APHIS (*Aphis solanina* Passerini) is not of much importance. It occurs under the leaves, but does not seem to do much harm to the plants directly; it may of course carry "virus" diseases. The small apterous females vary from green to dull brownish green, a few are almost yellow and some deep-green. The much shorter antennæ and cornicles and smaller size at once separate it from the other potato species.

Control.—Potato Aphides may be killed by spraying with nicotine and soft soap or quassia and soft soap, but dusting with nicotine dry spray seems best. It is only in bad attacks, however, that this is necessary. Seed potatoes certainly want attending to when Aphides are seen on them. They are best put in closed boxes and fumigated with tobacco shreds, or if few in number may be dipped in soft soap and nicotine solution. This is very important, as such attacked seed invariably produces poor plants and few tubers.

C. APHIDES ATTACKING CARROTS AND PARSNIPS.

1. Carrots are often attacked below ground by an Aphis known as *Anuraphis tulipæ* Boyer. The damage is done to the roots; the insects feeding on them cause them to split, as shown in the photograph. This cracking of course is often produced by excessive wet weather, but if this is the cause then the Aphides are not seen to be prevalent. The wingless ground form gives rise to alate females and males which come above ground at any time between September and December. The winged males appear in November and December.

The Carrot Aphis was very bad on the roots in 1901, 1904, 1918, 1921, and 1923 (fig. 18). It also attacks bulbs of lilies, tulips, Scilla, Chionodoxa, parsnips, etc.

The *subterranean apterous female* (fig. 19) is globular in form, pale and covered with meal; there is much variation in colour, some being pale-fawn to kid-glove white, dull olive-brown, others olive-green to pale-pink with the sides and thoracic segments often dusky; the dusky lateral marks continue along all the segments to a less extent; the last two segments are also darkened. Cornicles short and dark. Antennæ shorter than body. Legs brown, apices of the tibiæ and the tarsi dark. Length $\frac{1}{16}$ th of an inch.

The *winged female* has a shiny-brown to black head and thorax, with two pale bands between; the basal half of the abdomen is pale-ochreous to fawn, dull-yellow to green, some tipped with pink, remainder black above; sides ochreous; three large black spots before the cornicles, each with a blunt papilla. Cornicles rather short and black and cylindrical; legs ochreous, except apices of femora, tibiæ and the tarsi. Length $\frac{1}{12}$ th of an inch.

The *male* is winged, with dark-brown head and thorax and fawn-coloured abdomen with a dark dorsal area and dark lateral spots. Antennæ longer than the body; the penis is yellow and blunt and the claspers black.

This Aphis is much more common than is supposed, and its importance is not only that it attacks carrots and parsnips, but it is very prevalent on bulbs and corms and causes no inconsiderable loss to them as they sprout, unless the bulbs are cleaned of the plant lice beforehand. The American authorities have traced this pest on a great number of bulbs sent from Britain and the Continent, especially on tulips, lilliums, and crocuses. Probably it attacks the roots, bulbs and corms of all plants. It is often common on dock roots.

2. THE CARROT FLOWER APHIS (*Anuraphis dauci* Fabr.).—This is an Aphis which Fabricius described as living on the leaves, stalks and blossom-heads of carrots, and Koch evidently described the same species as his *Aphis carotæ*. I only know the apterous female, which is green of various shades, with very short black cauda and rather short black cornicles. It never seems to have done any serious damage, for the simple reason that as soon as it appears on the carrot leaves it is attacked and cleared off by hymenopterous parasites.

3. THE PARSNIP ROOT APHIS (*Anuraphis subterraneus* Walker) has also been found in numbers on parsnips, causing them to crack, but it is not of any marked economic importance. It can at once be told by the fine dotting on the cornicles.

4, 5. TWO WILLOW APHIDES (*Cavariella capreae* Fabr. and *C. pastinaceae* Sch.) also attack carrots and parsnips. Both these are found in summer on the leaves, but especially on the flower-heads of carrots and parsnips, and in some years do much harm to the seed crop, the insects densely clustering on the petioles of the umbels. They are both common on willow and osier leaves in spring and early summer, and about July they become winged and go on doing so into the beginning of August, when they migrate and settle on various wild and cultivated Umbelliferae, where they flourish until the autumn. At

the latter period winged forms appear and fly back to the willow, and there the egg-laying females deposit their eggs. The *apterous females* of *C. capreae* are green, with very short feelers and somewhat swollen cornicles; over the cauda is a short horn-like process by means of which they can at once be recognized (fig. 22). The *alate females* are also green, with dark head and thorax (fig. 24). The forms on the Umbelliferæ may give rise to a winged generation, and these pass to other Umbelliferæ in summer, so that the cultivated carrots and parsnips may be infected from the related wild plants as well as direct from the willows. The two species are very similar.

Control.—Beds where carrots or parsnips have been attacked by the root Aphid should be treated with naphthalene and at once dug in so as to kill the Aphides shaken off in pulling. The foliage and seed heads when attacked by *dauci* or *capreae* and *pastinaceae* respectively may be sprayed with any well-known contact wash; this is especially important in the case of the latter, as the two *Cavariellae* may much reduce the seed crop.

D. ATTACKING BRASSICAS.

THE MEALY CABBAGE APHIS (*Brevicoryne brassicae* Linn.).—No more objectionable sight can be seen than winter greens badly infested with Aphis. The whole plants now and then become a sticky mass of mealy Aphides, honeydew, and excreta, and to make it more repulsive still there may be found crawling about amongst them the fat leech-like larvæ of the hover-flies, predaceous insects trying to restore the balance of Nature. Such attacked plants are not only ruined for market but are killed right out. Some years this pest is almost absent, during others it does very much harm. In 1904–1905 it was very destructive in Kent and Essex. In the Dartford district alone hundreds of acres were attacked and thousands of pounds were lost. Again in 1911 it occurred in vast swarms; it caused much loss in Dorsetshire, Cheshire, Derbyshire, and again appeared in countless numbers in Essex. In 1917 there was a very bad attack until the August rains checked it. In the following year it did much harm, and in 1919 it was almost epidemic until November. In 1921 and 1922 it was exceedingly destructive and contributed materially to the shortage of winter greens. In 1921 it also attacked and rendered valueless large areas of turnips and swedes. All kinds of brassicas are attacked, as well as swedes and turnips, charlock, shepherd's-purse, seakale, wild radish, and rocket or wall brassica. The usual appearance of the Mealy Cabbage Aphis is in May, when a few may be found here and there on cultivated and wild brassicas. By June they may become more noticeable, small pallid blister-like areas appearing on the leaves beneath which the insects shelter; later these galled areas become almost white, and from July onwards, if the weather is propitious, they gradually increase and smother both the upper and under sides of the leaves and stalks, until, as stated by BUCKTON, "weight for

weight there is more animal than vegetable substance present." All the worst attacks have been in the autumn; the summer attack even if severe dies out suddenly and does not persist in such virulent form as the autumnal. Although all cultivated brassicas are attacked, perhaps brussels sprouts suffer most of all and cauliflowers least.

The *apterous viviparous female* (fig. 25) is rather elongated oval, of a dull greenish-grey hue with two series of eight black spots on each side of the back; legs, cornicles, eyes, and the tips of the antennæ are deep brown. The whole body is covered with a white mealy wax which quite hides the colouration. These females produce many living young, which are bright green and shiny; it is not until after their first moult has taken place that the mealiness appears. Nymphæ occur now and again from August onwards and give rise to the *winged* females (fig. 26), which have a dark head and thorax, dull-green abdomen, with a row of seven dark patches in the centre and a row of four black spots on each side; these may unite to form continuous dark bands. The antennæ are dark, also the cornicles, which are rather short and cylindrical; the length is about $\frac{1}{4}$ th of an inch to less. The male is winged, with dark head, dark thorax with a greenish band in front; abdomen greenish-brown to yellowish, a row of black spots on each side and a double row of six dark patches along the centre. Antennæ brown. Cornicles black. Length $\frac{1}{16}$ th to $\frac{1}{12}$ th of an inch.

The *egg-laying females* are wingless, pale-green or greenish-yellow, a row of black spots along each side of the abdomen and a double row of five dark patches along the centre. Antennæ dark-green. Cornicles dark. Hind tibiæ enlarged. Length $\frac{1}{4}$ th inch. These sexuales appear in autumn and onwards into the winter. The egg-laying females place their small eggs on cabbages, etc. At first they are yellow and then jet-black, elongated oval and about $\frac{1}{3}$ th of an inch long. One may find the ova, viviparous forms and sexuales all mixed up together. The leaves are sometimes blackened with the eggs. They hatch in April and become stem mothers which settle under a leaf and produce living young which surround them, forming a compact colony of small size. Much depends on the weather in the materializing of a bad autumn attack.

Natural Enemies.—This species is particularly preyed upon by parasitic and predaceous enemies. Hover-fly or Syrphid larvæ feed ravenously on the masses of insects. Ladybirds both adult and larvæ do so to some extent. Many hymenopterous parasites attack them in the autumn.

Control.—All old cabbage leaves and stumps should be burnt; by doing so thousands of the ova and over-wintering insects are killed and so prevented from doing further harm. All cruciferous weeds should be destroyed near the beds or fields, as many eggs are laid there and many living Aphides may over-winter there and be ready to infect the brassicas in spring and early summer; this especially applies to wild mustard, charlock and shepherd's-purse. The disease often starts in the seed beds, and if this is seen it pays to spray the plants and so stop the

insects being taken to the fields; the only successful spray is nicotine and soap. If this is not done all seedlings showing signs of *Aphis* should be discarded and destroyed. It is doubtful if spraying in the field would pay. When waste pepper was cheap it was used mixed with road dust for dusting sprouts, and it might even prove possible to spray sprouts when seen to be first attacked with soft soap and water or any cheap contact wash if the market price at the time would allow. The destruction as soon as possible of cabbage stumps and old leaves is a most essential matter, especially if the plants have been badly attacked. The same applies to the Green Peach Aphis (*Myzus persicae*) which also occurs in abundance and often does as much harm as the former insect.

E. LETTUCE APHIDES.

Four kinds of plant lice attack lettuces and endives, and in some seasons cause much loss by spoiling them for market, as the insects

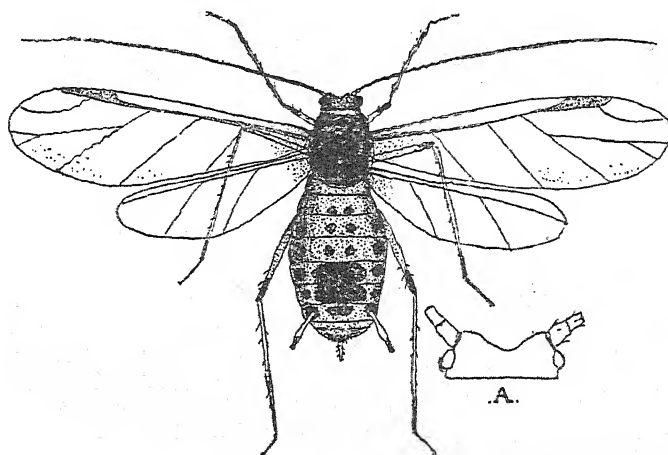


FIG. 30.—*AMPHOROPHORA LACTUCAE*.
Alate female.

breed rapidly in the hearts and make them obnoxious, and cannot easily be cleaned out even by much washing. One of the four (*Pemphigus bursarius*) attacks the roots.

(I) THE RIBES AND LETTUCE *AMPHOROPHORA* (*Amphorophora lactucae* Kalténbach) is the worst. This is a very common currant and gooseberry Aphis, which in some years swarms in the market gardens on lettuces and endives, breeding rapidly in both cos- and cabbage-lettuce, but especially in the former. The apterous female on lettuces is shiny-green to yellowish-green and the green antennæ have dark bands; the cauda and cornicles are green and the latter somewhat swollen; the yellowish-green legs have dark feet and in some dark apices to the other segments. The alate female (fig. 30) on lettuces has deep-brown to black shiny head and thorax, with a yellowish-green band in front of the latter; the abdomen yellowish-green with an

irregular dark broken area on the posterior half, two pairs of small black dots in front and three large and one small dark lateral spot and a large dark patch at base of each cornicle. Cauda pale-yellow. Cornicles yellow, swollen, dusky at apices. Legs yellowish-green, with dark apices to segments. The *alate female* on Ribes is very similar, but the dark abdominal area is not quite so large and there are traces on the first 2 to 4 segments of sub-median dark spots. The *apterae* are very similar also but of a somewhat deeper colour. This insect winters on Ribes in the egg stage, the latter having been deposited by oviparous females produced by the alate females that came from the lettuce, etc.; later these are joined by alate males from the same plants and sow-thistles. These insects breed rapidly on Ribes in some years, and do much damage. In late May and on to July they become winged and fly off to the summer food plants and

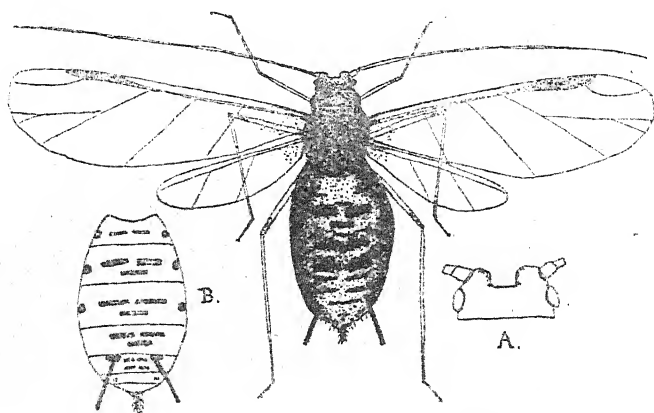


FIG. 31.—MYZUS LACTUCAE ON LETTUCE.
A. Head. B. On Ribes.

some settle on lettuces, others on sow-thistles and other plants. Alate broods are produced on the latter and fly off and attack other lettuces. This and the next two Aphides get right into the hearts of the lettuce plants and so spoil them for market, as they breed there in great numbers. Mid and late crops suffer most.

Another species, (2) THE ALLIED RIBES AND LETTUCE APHIS (*Myzus lactucae* Schrank), also infests lettuce in a similar manner and also comes from currants and gooseberries. It can at once be told from the former by the cylindrical dusky cornicles in the alate female. This form on lettuces has a dark head and thorax in the *alate female*, a green abdomen with five to seven irregular black broken bands and four dark spots on each side, apex of abdomen and cauda dusky. Cornicles dark brown, pale apically, sometimes *very slightly* swollen towards the apex. The *apterous female* is yellowish-green to light-green, some pinkish and the abdomen with seven pairs of dark lateral spots. Cornicles yellowish, dusky at apices, cylindrical. Cauda yellow. The *alate female* (fig. 31) on the Currant has a shiny-black thorax,

with a green line each side and a pale band in front; head green; abdomen shiny-green to yellowish-green, segments 2, 3 and 4 with two dark basal patches, 5 to 6 each with two smaller patches close together, 3 large and 1 small dark lateral spots. Cornicles long, thin, cylindrical, black, paler apically. Legs same colour as body with dark areas. The apterous female is much like that on the lettuce. Like the former species it winters on the Ribes and leaves them in late May and June and flies off to the lettuces, endives, sow-thistles, etc., and there the alate females produce young, and reproduction goes on all the summer. In the autumn winged return migrants fly from the lettuces to the Ribes and there give rise to the oviparous females; having copulated with the winged males, the former lay their ova on the currant and gooseberry bushes. In wet weather the damage done by these plant lice to lettuces, etc., is intensified, and the interior of the lettuce becomes not only disfigured by the insects but also rots.

A third species, (3) THE DARK LETTUCE AND SOW-THISTLE APHIS (*Macrosiphum sonchi* Linnæus), also does some damage. It is common to all Europe and occurs in America. It lives on *Sonchus oleracea*, *Lapsana communis*, *Lactuca* spp., *Serratula arvensis*, *Crepis* spp., *Hieracium* spp., *Carduus* spp., etc. WALKER recorded as many as thirty food plants. The apterous female is rich chestnut-brown to deep shiny red, the abdomen with rows of hairs, arising from tubercles; the cornicles are long and black and thin; the cauda yellow. The alate female has a deep black head and thorax; the abdomen shiny chestnut to red-brown, with three black spots on each side before the cornicles and one behind them; a dark patch at base of the cornicles and an elongated black patch between them. The cornicles are long, thin, and black; cauda pale. Legs yellowish to yellowish-brown, with black areas. It attacks lettuces and endives when in seed and then will do much harm, but it seldom infests lettuce for market.

Control.—The only possible control consists of destroying these Aphides when on Ribes in winter or spring by spraying with Carbolineum emulsions to destroy the ova or with nicotine soap washes to kill the hatched insects. Needless to say, all sow-thistles, Crepis, Lapsana, and other weeds should be kept down, but when once lettuces are attacked it would not pay to adopt any curative treatment, even if such were feasible, for the insects shelter in the hearts and cannot be touched.

(4) THE POPLAR GALL AND LETTUCE ROOT APHIS (*Pemphigus bursarius* Linn.).—One frequently finds on pulling lettuces, especially late ones, that the roots are covered with a white flocculent wool (fig. 21). This is due to an Aphis which comes from the poplar, known as *Pemphigus bursarius* of Linnæus. In some seasons so many of these subterranean Aphides occur that they kill the late autumn and early spring lettuces. In 1910 it was very harmful to cos-lettuce at Wigan and at Market Drayton. In 1917 it also caused much loss in the

West and in Wales and Kent. The insect winters in two ways : (1) on the roots of lettuce and other similar plants, and (2) in the egg stage on poplars, where the stem mothers form very marked galls on the leaf stalks (fig. 14). One of these galls is formed by a single stem-mother Aphis and in it she produces her young ; the gall later bursts and the alate Aphides fly away, usually in July. It is these winged flies that place their young on the soil near lettuce and other roots. The *alate female* (figs. 16, 17) is viviparous, and has a black head and thorax and greyish-green to pale-green body, and is covered with white meal and flocculent matter ; the antennæ are short and there are no cornicles visible. The young she produces, the so-called *Pemphigus lactucarius* of Passerini, are pallid yellowish-white to pale yellow and are mealy ; head, legs, and antennæ dusky and feelers short (fig. 15). They are found in colonies in the soil, often in cavities thickly massed together ; near and around as well as on the roots of lettuce, sow-thistle, cabbage, wallflower, beetroot, and wild Chenopodiums. They increase rapidly on the lettuce roots and may continue to do so all the winter. At the same time alate females may arise from them in late September, October, and November ; these have a dull head and thorax ; the abdomen varies from pale yellowish-green, pale green to dull greyish-green, with darker central mottlings ; the cornicles are very small and only slightly raised. These alate *lactucaria* fly off to the poplars, where they produce sexual forms and eggs are laid on the buds. On the bursting of the galls produced by them, winged females fly off, and those that settle near lettuce, sow-thistle, and Lapsana, etc., drop their young to live in the ground. It becomes first noticeable on lettuce roots in August and gradually increases until February, when it dies down and none can be found from May to July.

Control.—Obviously we cannot stop infection of the soil, as it is impossible to deal with the insect on poplar trees, but where summer lettuces have been attacked it is just as well to destroy the insect in the soil, especially if lettuces for late winter and early spring use are to be planted there. The common practice of leaving lettuces killed by frost or rotting from wet in the soil should be avoided. As it will not only live on lettuces but sow-thistles, etc., if these occur and any white wool is found on the roots it is most essential that they should be burnt and the ground dressed with naphthalene and dug in or it should be very deeply cultivated.

F. CELERY APHIDES.

In some seasons celery is attacked by Plant Lice, two species being recognizable, the *Aphis apii* Theobald and the *Cavariella capreae* Fabr. The former occurred in great numbers at Ely in 1903, and did much damage also at Wye in 1907. The *apterous female* is green, the cornicles, cauda, apices of antennæ and the tibiæ and feet dark ; antennæ a little shorter than the body. Cornicles cylindrical. Length

$\frac{1}{4}$ th of an inch. The *alate female* has dark head and thorax ; body green to light apple-green ; cornicles and cauda darker ; antennæ shorter than the body. Cornicles cylindrical, cauda nearly as long as the cornicles. Length $\frac{1}{4}$ th to $\frac{1}{6}$ th of an inch. The apteræ cluster on the young and tender leaves and curl them up, but may also be found scattered over all the plant. The attacked leaves die off.

Another species has been described by WALKER as *Aphis inculta*, with very short cornicles, on wild celery. The Willow Aphis (*Cavariella capreae*) occurs on celery when in bloom and seed, but I have never heard of it doing any harm.

Control.—In the few attacks that have been noticed spraying has had to be resorted to, and it was found that the soft soap in the wash has to be very adhesive—as much as 10 lb. to 100 gallons—to hold on to the leaves.

G. ATTACKING CUCUMBERS, MELONS AND MARROWS.

I. THE COTTON AND MELON APHIS (*Aphis gossypii* Glover).—This cosmopolitan Aphis is often very harmful to all cucurbitaceous

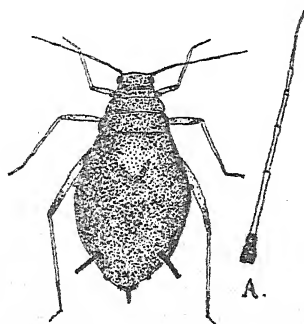


FIG. 32.—APHIS GOSSYPHII.
Apterous female. A. Antenna.

plants and abroad to cotton. In this country it mainly occurs under glass on melons and cucumbers and in the open it attacks marrows and other plants. The food plants of this species are very varied. The insects attack the leaves. The *apterous viviparous females* (fig. 32) vary very much in colour ; some are yellow to yellowish-green or all green of various shades, yet others are almost black ; the antennæ are rather short, reaching to the middle of the body or just beyond. The cornicles are black or deep green and rather long and cylindrical and diverging. The cauda is greenish to black, less than half the length of the cornicles ; there is a small conical papilla on each side of the thorax and one between the cornicles and the cauda and smaller ones towards the head end. Legs yellow to green, with dark areas. In length from $\frac{1}{4}$ th to $\frac{1}{2}$ th of an inch.

The *winged female* (fig. 33) is yellow, pale yellowish-green to dark-green ; the head and thorax dark brown to black ; abdomen with

four dark lateral spots, in some only three, and there are also some dark dorsal spots making two or three broken transverse bands. Antennæ shorter than body. Cornicles cylindrical and black; cauda yellow, from half to rather more the length of the cornicles. Length $\frac{1}{12}$ th to $\frac{1}{14}$ th of an inch. No sexual forms are known. It is much more of a serious pest in warm climates than with us, but nevertheless does damage here, especially under glass. It has frequently done some

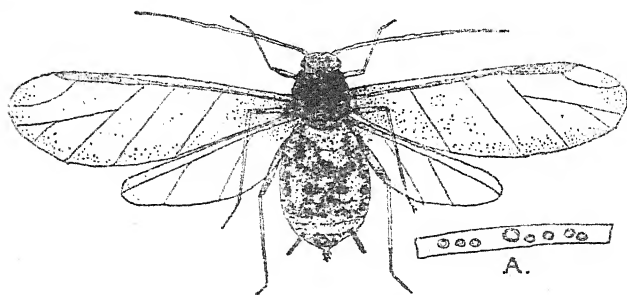


FIG. 33.—*APHIS GOSSYPHII*.
Alate female. A. Third antennal segment.

harm to marrows and cucumbers in the open, but I have never known it to do such damage in the open as it does even under cold houses, where it becomes a potential pest now and again.

Control.—It may easily be controlled by thorough spraying in cucumber-houses, but in melon-frames it is best dealt with by fumigating with tobacco shreds, as it is difficult or wellnigh impossible to get at the leaves beneath by spraying or dusting.

H. ATTACKING ARTICHOKE

1. THE ARTICHOKE ROOT LICE (*Trama troglodytes* Heyden, and *T. radialis* Kalt.).—Jerusalem artichokes are very often attacked by pale-coloured subterranean Aphides known as *Trama troglodytes* Heyden, and an allied insect *T. radialis* Kalt. Although they do not in the least affect the growth of such strong plants, they nevertheless by means of their constant puncturing of the tubers cause many to decay before they are lifted and many more afterwards. These Aphides frequently occur in masses in artichoke beds and are always attended by countless ants, the ants taking from them the sweet honeydew they exude. These pale, fat Plant Lice can at once be told by their long hind legs, the so-called second tarsal segment being very long, and by the curious manner they lift up their hind legs if touched or frightened, which they do immediately an ant strokes them with its antennæ, so as to encourage the flow of honeydew. The *apterous females* (fig. 23) vary in colour from pale yellowish-white to pearly-white or dull yellowish-green, often semi-transparent. The antennæ are all or partially brown, less than half the length of the body; legs long, especially the hind pair; the last hind tarsal segment being always

much more than half the tibiae; the tail is not prominent, being with the end of the body rounded. The *alate female* has a broad head and thorax and a small body; antennae short, not much longer than the head and thorax, and the cornicles are slightly raised. Length to $\frac{1}{8}$ th of an inch. An allied species, *Trama radialis* Kaltenbach, may be told by the visible cornicles in the apteræ and by the larger eyes. Both may be found in the soil at all times of the year, right through the winter. These apteræ feed on the roots of many other plants, including sow-thistles, thistles, *Crepis*, *Hieracium*, *Chicorium*, *Artemisia*, etc., and are frequently found associated with ants in their nests.

Control.—After artichokes have been lifted the beds should be dressed with some soil insecticide, as the insects go on increasing in the soil.

2. THE PALE ANT APHIS (*Forda formicaria* Heyden), another pale subterranean Aphis, now and then attacks artichokes and has once been found breeding on potatoes. It is frequently associated with ants. The hind legs are not elongated.

I. ATTACKING SPINACH AND BEETROOTS.

THE BLACK FLY, OR COLLIER (*Aphis rumicis*), is often very harmful and causes the leaves to crumple up; in the case of winter spinach the attack does not matter, as any that occur are too late to do much harm, but with summer spinach whole beds may be rendered unfit for market in bad Aphis years unless care has been taken to hand-pick the first few attacked plants. Beet spinach is also too late to suffer from it. Beetroots, especially the paler-leaved varieties, also suffer; the Blood Reds do not do so. Both beetroots and spinach beet are also now and then infested with the GREEN or BOAT-GALL APHIS (*Hyalopterus atriplicis* Linnæus). This Aphis forms curious boat-shaped galls on the leaves of Chenopodiaceous plants, the sides of the leaves bending downwards and inwards. It is common on many wild Chenopodiums and *Atriplex*, but when it occurs on the beetroot and beet spinach or mangolds it does not distort the foliage in the same way as on the smaller-leaved wild Chenopodiums. It is widely distributed over Europe and occurs in America. The apteræ are greenish, the head yellowish-green, with two dark spots; the cornicles are very small and pale yellow-green, with dusky apices, and the whole body is covered with meal. These apteræ live and breed in the boat-shaped galls, or more freely on the leaves of beet and spinach beet where they cause swollen patches at the sides of the leaves. Alate females occur now and again and fly about; their body is green to yellow-green, with dark lateral spots and dark head and thorax and very short pale cornicles and rather long pale cauda and short dusky antennae. Sexual forms occur in the autumn and the apterous egg-laying females lay their eggs in the seed heads, and in this way no doubt it is spread about. It is only of importance when it attacks the plants grown for seed. It is never a serious pest.

CONTRIBUTIONS FROM THE WISLEY LABORATORY.

XLV.—INSECT PESTS OF RHODODENDRONS.

By G. FOX WILSON, N.D.H., F.E.S., Entomologist.

DURING the past few years many enquiries have been received concerning the damage done to Rhododendrons by insects. Attempts have been made at Wisley to ascertain the species implicated and the measures to be used against them. Leaves and roots are the parts generally damaged.

In order to simplify identification, a key is appended whereby the species of insect responsible for the damage may be recognized.

LEAF FEEDERS.

<i>Symptoms of attack.</i>		<i>Agent responsible.</i>
A.—Clean-cut holes in foliage	{ Nos. 1-5 . . .	. Moth larvæ, 5 species.
	{ No. 8 . . .	. Leaf-cutting bee.
B.—Clean-cut holes, sometimes accompanied by nibbling of the epidermis	{ No. 6 . . .	. Tortrix larva.
	{ Nos. 9, 10, 11 . . .	. Weevils, 3 species.
C.—Rolling of the young leaves	No. 7 . . .	. Tortrix larvæ.
D.—Marbled and mottled appearance	{ No. 12 Rhododendron bug.

ROOT FEEDERS.

E.—Stripping off of fibrous roots	{ No. 13 Cockchafer larva.
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It is proposed to deal with each pest separately, and describe their several stages, life-history, and remedial measures.

LEAF FEEDERS.

Moth Larvæ.—The following species have been recorded as damaging Rhododendrons :

1. Winter Moth, *Cheimatobia brumata* L.*
2. Scalloped Hazel Moth, *Odontoptera bidentata* L.†
3. Yellow-tail Moth, *Porthesia similis* Fuesl.,‡ in the United States, on plants that had been received from Holland.

During the latter part of May 1924 two species of Tortrix—(4) *T. podana* Sc. and (5) *T. leacheana* L.—were found at Wisley damaging *Rhododendron galacteum* and *R. calophytum* (fig. 34). The worst damage was done to the young growths, which are covered with a white, velvety pubescence. Many leaves were completely eaten as far as the midrib, which was left untouched.

* CARPENTER, G. H., *Econ. Proc. R. Dublin Soc.*, ii. No. 12, Sept. 1916, p. 232

† MACDOUGALL, R. S., *Trans. Highland and Agric. Soc. Scotland*, 1914.

‡ SASSCER, E. R., *Jour. Econ. Entom.*, Concord, xi. No. 1, Feb. 1918, pp. 125-129.

4. *Tortrix podana* Sc.—It is not unusual to find this species feeding on Rhododendrons, and in the summer of 1924 it was a very real pest of these plants at Wisley.

Descriptions.—The moth (fig. 35, 1) has chestnut-brown forewings and greyish hind-wings which are broadly orange. When at rest this species resembles a dead leaf. The first pair of wings are arched over the body and are acutely angled at their extremities.

The larva is green with a darker dorsal line, somewhat plump when mature, and the head and thoracic plate are of a very dark brown colour.

The larvæ are common and a frequent pest of oak, apple, and blackberry. They have a habit of fastening two leaves together by means of a silken web, and feed between the two layers. On Rhododendrons, however, they fed openly and did not attempt to conceal themselves between leaves.

5. *Tortrix leacheana* L.—This species was less common on Rhododendrons, and the damage committed by individual larvæ was of less importance than *T. podana*.

Descriptions.—The moth (fig. 35, 2) is much smaller than the last mentioned. Its fore-wings are dark brown more or less diffused with rusty-yellow; the edges of the central bands are defined by leaden-metallic lines, and the hind-wings are greyish. The larva is light green with the dorsal area darker, of an olive colour. The head is light brown.

The larvæ were well protected on the young foliage by reason of their colour, and they were less voracious than the larvæ of *Tortrix podana*. Its normal food plants are oak, willow, and maple.

6. *Tortrix species.*—In December 1923 the larvæ of an unknown species of *Tortrix* were found destroying the leaf epidermis of plants of *Rhododendron ponticum*, which were being grown under glass preparatory to their use as stocks for grafting. The larvæ fastened two leaves together, much in the same way as the larvæ of *T. podana* habitually do, and devoured the upper and lower epidermis (fig. 36, B and C). Unfortunately the larvæ died before pupation, and the species could not be identified.

Remedial measures.—An attack can be readily prevented by an arsenical wash or dust, and the latter form of application was found to be more satisfactory on account of the insufficient retention of a lead arsenate spray. This difficulty arises from the presence of the thick pubescence on the young leaves of certain species of Rhododendrons, which causes a cushion of air at the base of the hairs, preventing the actual wetting of the foliage. The older and glabrous leaves retain a sufficient amount of wash provided that a "spreader" such as saponin is present. The most useful formula is 1 lb. of lead arsenate to 20 gallons of water, with the addition of about $\frac{1}{2}$ oz. of saponin. The wash must be applied by means of a fine nozzle, and care taken that not too much wash is put on the leaves, otherwise dripping will occur and waste result.

Hand-picking the affected leaves must be resorted to in the case of those larvæ which fasten leaves together, as an arsenical wash would not reach the food and poison the larvæ within the rolled leaves.

7. *Tortrix species*, including the Oak-leaf Roller Moth (*T. viridana* L.) and *T. rosana* L., often pupate within the rolled leaves of many plants which are grown beneath oak trees. When fully grown, the larvæ let themselves down from the oak by a silken thread and, on reaching the undergrowth, prepare their pupation quarters by rolling the leaves into a tube. No direct damage is done, for the larvæ do not feed on the foliage, but, indirectly, growth is retarded and the rolled leaves are unsightly.

The best means of remedying this trouble is to go round the affected bushes and pinch the leaves between the fingers.

8. The Leaf-cutting Bee, *Megachile* sp., probably *maritima* Kirby.

It is not unusual to find several leaves of *Rhododendron ponticum* and other species made unsightly by the work of leaf-cutting bees (fig. 36, A), of which *M. maritima* is the most probable culprit, for this species is not particular in its choice of leaves. These bees cut out both circular and oblong pieces from various plants to line their nests, which they make in old posts, decaying wood, stumps of trees, and in banks. The culprit is the female, which cuts out the desired pieces by means of her mandibles, which are used compass-fashion. These bees somewhat resemble hive bees, and may occasionally be seen flying off with their load. The nests are made by the removal of wood or soil until a cylindrical tube is formed, which is then lined with pieces of leaves cemented together. Cells are formed, one on top of the other, until several compartments are made, each cell being stored with a mixture of honey and pollen. An egg is laid in each completed cell. On emerging, the young larvæ feed on the food provided, eventually pupating in the cell and appearing as adults in the following year.

Remedial measures.—Little can be done to remedy the work of this spoiler, except to destroy the nests and capture any bees found on the leaves.

Weevils are one of the worst pests of *Rhododendrons*, and an enormous amount of damage is done to young bushes. The principal species concerned are :

9. The Vine Weevil, *Otiorrhynchus sulcatus* F. ;

10. The Clay-coloured Weevil, *O. picipes* F. ; and

11. The Nut-leaf Weevil, *Strophosomus coryli* F.

There may be other species which will feed on the foliage and buds, but the remedies suggested against the above-mentioned species will effectually prevent damage being committed.

MCLACHLAN * exhibited before the Scientific Committee of the Royal Horticultural Society specimens of *Strophosomus limbatus* F. which had been found damaging *Rhododendrons* at Sunningdale.

* *Gardeners' Chronicle*, 3rd ser., vol. iv. 1888, p. 18.

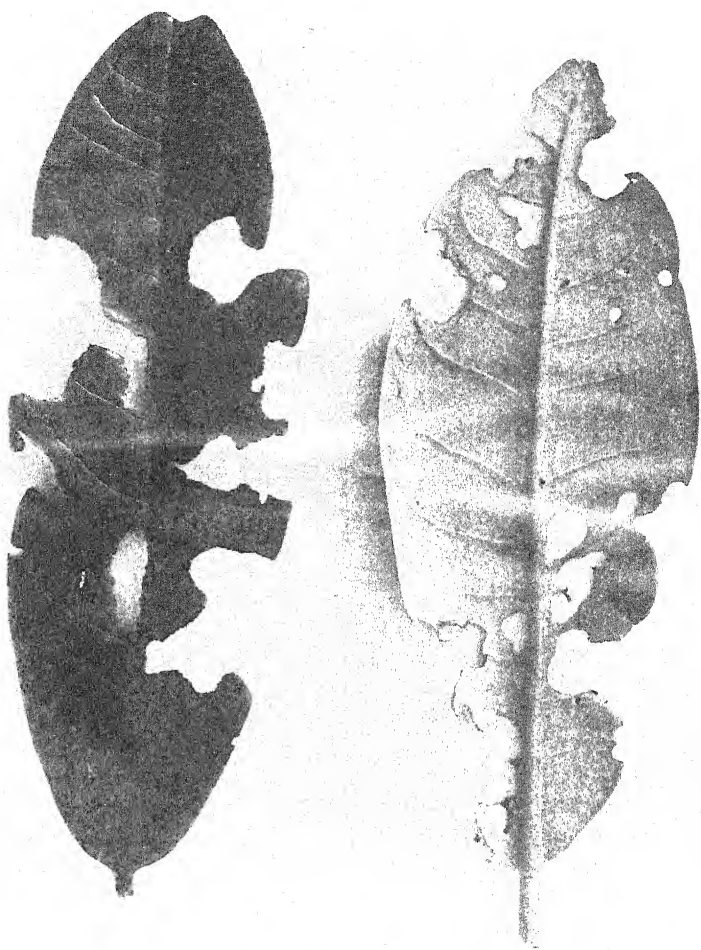


FIG. 34.—RHODODENDRON GALACTEUM ATTACKED BY TORTRIX PODANA.

[To face p. 48.

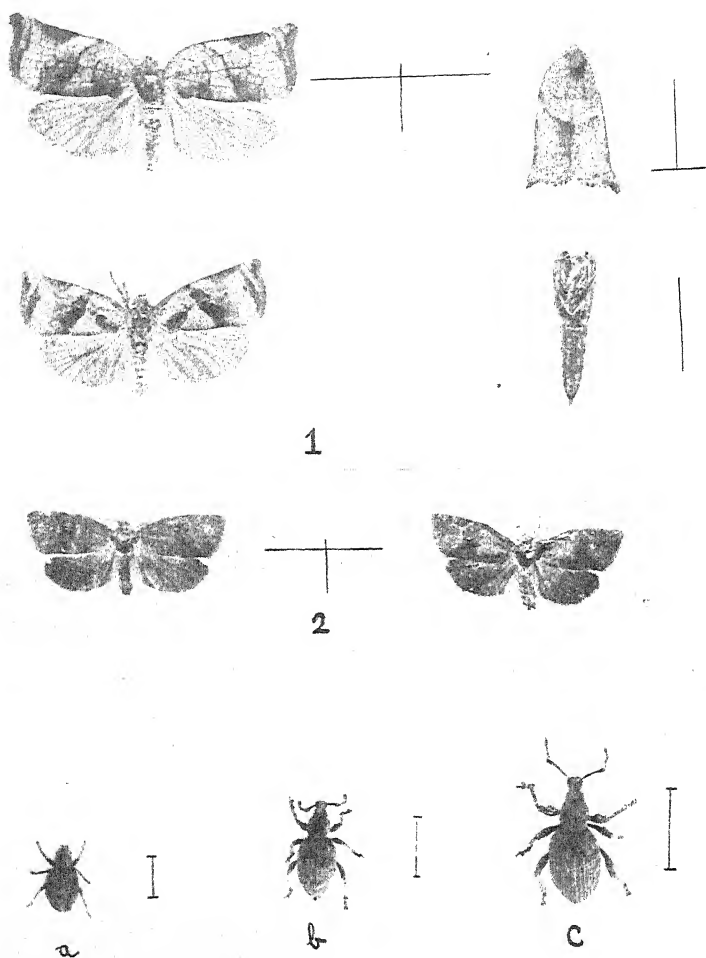


FIG. 35.—1. *TORTRIX PODANA* Sc. (attitude at rest on right; pupal case beneath).
 2. *TORTRIX LEACHEANA* Linn.
 3. (a) NUT-LEAF WEEVIL (*Strophosomus coryli* F.); (b) CLAY-COLOURED WEEVIL (*Otiterrhynchus picipes* F.); (c) VINE WEEVIL (*O. sulcatus* F.).

Dr. HUGO MÜLLER* exhibited before the same Committee damaged leaves of *Rhododendron ponticum* and *Gaultheria Shallon*, which were said to be regularly injured every spring by a species of *Otiorrhynchus*, and to such an extent that many of the leaves were completely destroyed with the exception of the midribs.

In the early stages of attack, the three species of weevils above mentioned eat out small holes on the edge and in the middle of the leaves (fig. 37), but eventually devour the whole leaf with the exception of the midribs, which are left intact.

MILLAIS, in his monograph on the "Genus *Rhododendron*" (1917), mentions that weevils are by far the most important pest, and that all low-growing species, especially the dwarf Chinese species (*R. haematodes*), suffer very severely from the attacks of weevils, but the species implicated are not mentioned.

In Mr. MILLAIS' garden in West Sussex, plants of *Rhododendron caucasicum* (pink hybrids) are only attacked to a slight degree by weevils, whilst *R. Jacksoni album* (*R. caucasicum* × *R. arboreum album*) is left untouched, although the plants are adjoining those which are much eaten. This apparent preference for certain varieties is no criterion that the plants left untouched would not be eaten if they were the sole species in the garden.

These weevils are nocturnal feeders, hiding away in the day-time beneath stones and clods of earth, in moss and at the roots of various plants, and thus they escape notice. This group of insects can be readily distinguished by the presence of a blunt snout, or rostrum, on which are borne the elbowed antennæ. The wing-cases are sealed down and they are devoid of wings. Another peculiarity of the two species of *Otiorrhynchus* is that the male is unknown, all the specimens being females and breeding parthenogenetically.

9. The Vine Weevil, *Otiorrhynchus sulcatus* F.—This species has been recorded as a *Rhododendron* pest in America,† Germany,‡ Holland,§ and Sweden.|| It was introduced into America from Europe, and has become a pest of *Rhododendrons* and *Taxus* in several nurseries. In Holland the same species is recorded as partial to the same host plants, the leaves and buds of which it eats characteristically.

Description.—The adult (fig. 53, 3c) is about $\frac{3}{8}$ inch long, black, with a deeply furrowed rostrum. The antennæ are reddish. The thorax is granulated and has a shallow median groove; the wing-cases are rough and deeply furrowed with scattered patches of pale yellowish hairs; the legs are black.

The larva is $\frac{3}{8}$ inch long when fully grown, whitish, and sparsely covered with light brown hairs; much wrinkled, legless. The head

* *R.H.S. Jour.*, vol. xvii. 1894, p. xxv.

† *Scientific Notes, Jour. Econ. Entom., Concord*, viii. No. 6, Dec. 1915, pp. 549-554.

‡ THIEM, H., *Zeitschr. angew. Ent.*, Berlin, viii. No. 2, May 1922, pp. 389-402.

§ *Inst. voor Phytopath., Wageningen, Vlugschr.*, No. 11, June 1914.

|| KEMNER, N. A., *Trädgårdar, Stockholm*, No. 18, 10, v. 1916, p. 145.

is brown and hard, and the jaws are much darker. It is always slightly curved.

The pupa is whitish with reddish eyes, and covered with tawny bristles. It is naked and not enclosed in a cocoon.

Life-history.—The eggs are laid in the soil at the base of plants from July to September. Its hosts are numerous, and include both hardy and greenhouse plants. At Wisley, for example, larvæ have been found damaging the roots of Saxifragas,* Lewisias, Sedums, *Primula japonica* and other species, *Spiraea Aruncus*, and the corms of *Cyclamen persicum*. The eggs hatch in about ten to fourteen days, when the young larvæ at once commence to feed on the roots and corms. They feed during the autumn and winter months, and pupate in an earthen cell in February, March, and April, according to their habitats. The adults emerge from the middle of May to the end of June and feed on the foliage of numerous plants, e.g. vines, ferns (*Polystichum*), strawberries, cyclamen, and Rhododendrons.

10. The Clay-coloured Weevil, *Otiorrhynchus picipes* F.—This species is widely spread, and its fondness for raspberries has given to it the alternative name of the Raspberry weevil. Its host plants include fruit, e.g. apple and strawberry, root crops, hops, and pot plants, and, occasionally, Rhododendrons. In May 1923 both seedling and bush Rhododendrons were severely attacked by this weevil and *Strophosomus coryli* at Woodham, about 3½ miles from Wisley. The Rhododendrons 'Ascot Brilliant' and 'Doncaster' were the most badly attacked, whilst at Wisley *R. basilicum*, a new Chinese species, suffered most.†

The last-mentioned species had its foliage riddled (fig. 37), although the leaves are above the average thickness and their under surfaces are covered with thick brown pubescence. On examining the bushes after dark by means of a lantern, large numbers of these two weevils were captured by jarring the bushes over a beating-tray, as many as twenty being shaken from a small bush 2 feet high. Considerable numbers were captured by laying pieces of sacking round the bases of the bushes, the weevils using them for hiding in during the day.

Description.—The adult (fig. 35, 3b) is about ½ inch long, black, and covered with a light brown and greyish pubescence. The thorax is strongly granulated, and the wing-cases are covered with varying shades of brown scales, giving to them a tessellated appearance. The legs are reddish-brown.

The larva is about ½ inch long, whitish and legless, and closely resembles the last species.

The pupa resembles the Vine weevil, but the eyes are black.

Life-history.—There is a close resemblance to the Vine weevil in its habits, except that this species prefers the buds rather than the leaves.

11. The Nut-leaf Weevil, *Strophosomus coryli* F. (fig. 35, 3a).—The

* WILSON, G. FOX, *Entomologist's Monthly Magazine*, Feb. 1923, p. 38.

† WILSON, G. FOX, *ibid.*, Sept. 1923, p. 200.

damage to Rhododendrons by this species is distinct, as it invariably confines its attacks to the epidermis (fig. 37, *a*), and rarely eats out holes like the two preceding species.

Description.—The weevil is about $\frac{1}{8}$ inch long, almost spherical, and of a uniform brownish-grey colour. The scales on the wing-cases are easily rubbed off. At the apex of the wing-cases, near the thorax, there is a black stripe which is a distinguishable feature of this species. Alternate rows of finely punctured lines and bristles occur on the wing-cases, and the covering scales are easily rubbed off. The antennæ and legs are reddish-brown.

The larva was found by VON BOHUTINSKY,* and adults reared from eggs laid in captivity. The larvæ are root-feeders and prefer the roots of weeds rather than those of forest trees.

Remedial measures against weevils occurring on Rhododendrons include :

(i) *Jarring*.—This operation, if properly carried out, will be found very effectual for clearing these pests. The affected bushes should be examined after dark with the help of a lantern, whose light should not be flashed on untreated bushes, for the weevils fall to the ground and feign death on the slightest disturbance. A sheet of coarse brown paper, linen or canvas (greater success will attend the use of white material, which will show up the weevils better) should be spread round the bushes, which should then be shaken. The weevils will fall on to the sheet and can then be put into a bucket of water with a film of paraffin, or burnt. This operation can be used with great success on young bushes, but to attempt to treat large shrubs would be folly.

(ii) *Trapping*.—This method of eradication is one of the best, for the weevils readily take advantage of pieces of sacking, small heaps of moss, straw, and wood wool and boards laid down near the bushes to hide in during the day-time. The trap that gave most satisfaction was sacking, which was cut into small pieces and rolled up and placed beneath the affected bushes. These traps should be examined daily and all captives destroyed. It was found that as many as sixty weevils were caught in a single day by this method, and repetition over a period of a week was sufficient to clear the pest.

MASSEÉ † found that *Otiorrhynchus picipes* was captured in large numbers by the use of sacking bands placed round fruit trees.

(iii) *Spraying*.—This operation is the most successful method for treating shrubberies, where jarring and trapping operations could not be so readily performed.

A wash composed of 1 lb. of lead arsenate to 20 gallons of water with the addition of a 0.012 per cent. saponin is efficient against these pests. The foliage should be lightly sprayed, otherwise the wash will run off the glossy foliage. One application is usually not sufficient, especially if heavy rains come soon after spraying.

* *Entomologische Blätter*, vii. 1911, p. 183.

† MASSEÉ, A. M., *Jour. Pomology*, vol. iv. No. 1, p. 36.

12. The Rhododendron Bug, *Stephanitis rhododendri* Horvath.—This pest was first recorded in Britain in 1910, and has been described by THEOBALD * and HOARE,† and an account appears in the Ministry of Agriculture's Journal.‡ According to CHAMPION, the home of this bug is the Eastern United States, and it reached Europe on imported plants. Its host plants include Rhododendrons and *Kalmia latifolia*, and the damage it does is very serious. It is scheduled under the Sale of Diseased Plants Order, 1921 and 1922. This species has been recorded in the United States, France, Holland, Switzerland, and Japan.

This bug is more partial to some varieties of Rhododendrons, and whereas *R. ponticum* is not a favoured host some of its hybrids are, and *R. fastuosum* is the chief sufferer at Wisley.

The presence of this pest can be easily seen by the leaves becoming mottled on the upper and chocolate-spotted on the under surfaces (fig. 38, B, C). By the continual sucking of the sap by the nymphs and adults the leaves turn brown and leathery and growth ceases.

Description.—The adult (fig. 40) is about $\frac{1}{4}$ inch long, oval, with a shiny black body which is covered with lace-like wings and an expansion of the thorax (pronotum). The wings are cream-coloured, with netted veins. The antennæ and legs are long and rather pale.

The nymph (fig. 39) is more conspicuous than the adult on account of numerous dark-brown spines projecting from a yellowish body. The wing-pads are seen after the second moult. The antennæ are as long as the body.

Life-history.—The eggs are laid on the under surfaces of the leaves within the epidermis of the midribs in late summer and autumn. The nymphs emerge in the following May and June and are at first very inactive, living gregariously. It is not unusual to find thirty to fifty nymphs clustered together on a single leaf (fig. 38, A). As they become mature they separate, whilst the adults wander all over the bushes, but prefer the younger growths. The adults are active on their legs but do not appear to use their ample wings. After pairing, the eggs are laid in August and September.

Remedial measures.—(i) Spraying. The most efficient results will be obtained by the use of either a 1 per cent. soft soap, derris or nicotine and soap washes. Two, and sometimes three, applications are necessary on account of the irregular hatching of the eggs. The first spraying should be performed by the second week in June, and the second three weeks later. It is essential for success that the wash should be directed to the under surface of the leaves, and this can be carried out with ease provided that a swivel nozzle or an angle bend adaptor is used. A good pressure must be reached, otherwise the wash will not act.

(ii) Hand-picking. On young bushes, and during early attacks,

* *Jour. S.E. Agr. College, Wye*, No. 22, 1913, pp. 297-302.

† *R.H.S. Jour.*, xlviii. Pt. 1, pp. 16-21.

‡ *Jour. Ministry of Agric.*, xxix. No. 6, pp. 555-558.

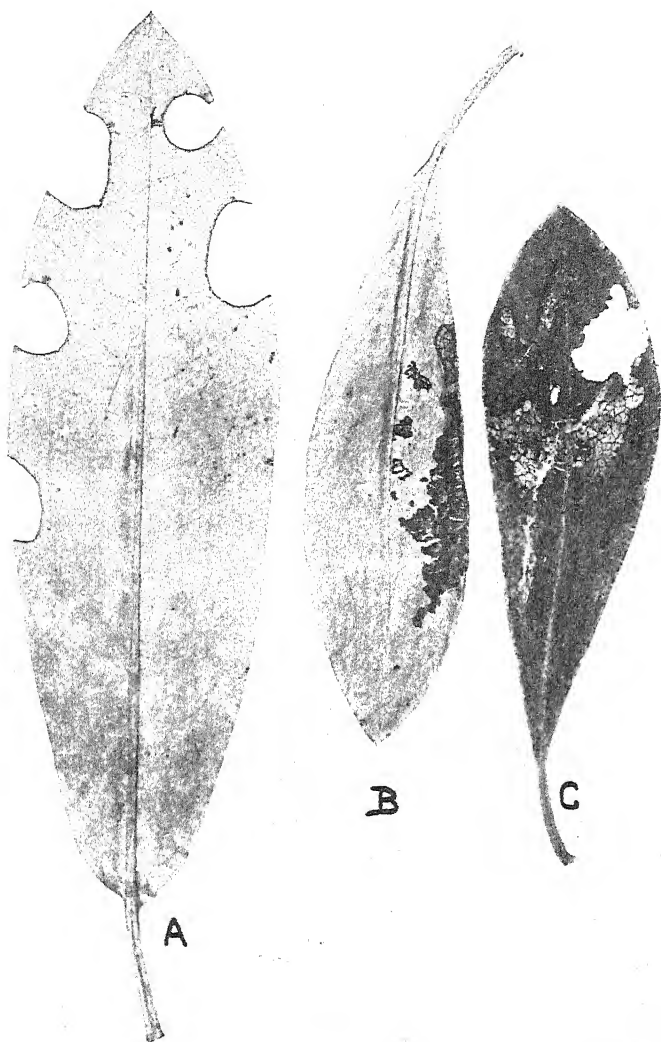


FIG. 36.—RHODODENDRON HYBRIDS ATTACKED BY
 (A) LEAF-CUTTING BEE (*Megachile*); TORTRIX LARVÆ (B) lower, and (C) upper
 surface of leaf.

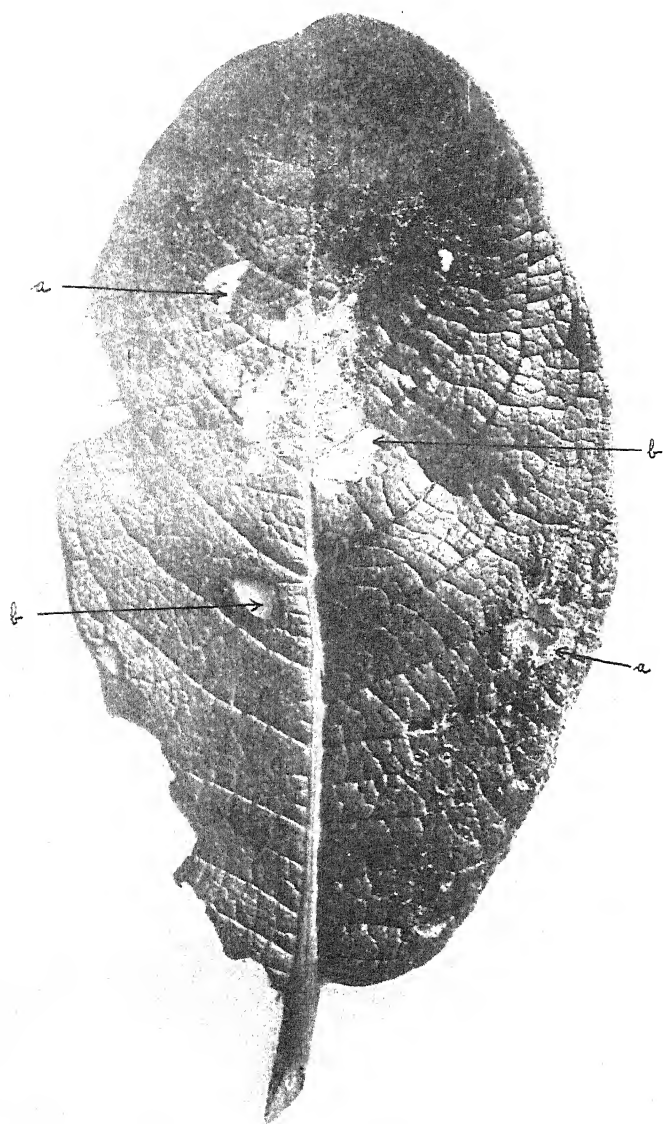


FIG. 37.—RHODODENDRON BASILICUM ATTACKED BY (a) STROPHOSOMUS CORYLI,
(b) OTIORRHYNCHUS sp.

the clusters of nymphs on the leaves should be picked off and burnt. During June it is quite easy to see these immature bugs, as they remain in clusters for several weeks, only separating when they become almost adult bugs.

ROOT FEEDERS.

13. Cockchafer, *Melolontha melolontha* F.—The larva of this chafer often proves a serious pest of Rhododendrons in gardens and nurseries by stripping off the fibrous roots, with the result that growth is checked and death of the plant often follows. The chafers are seen flying about at night in the neighbourhood of trees, especially oaks, the foliage of which they feed upon, and during the day they are to be found at rest beneath the leaves of various plants.

Description.—The adult is 1 to 1½ inch long. The head and thorax are black, and the wing-cases brown and covered with pale hairs. There are five raised lines on the wing-cases. The abdomen is pointed and bears five triangular white marks along its sides. The antennæ are characteristically clubbed.

The larva is 1½ inch long when mature, cream-coloured, fleshy, with a reddish-brown head and legs. The four-jointed antennæ are conspicuous and longer than the jaws. The first pair of legs are shorter than the two hind pairs. The body is transversely rough, and is supplied with short bristles and long hairs. The last body segment is large, smooth, and darker than the other segments.

The pupa is about 1 inch long, naked, so that all the future appendages of the adult chafer can be distinguished with ease; the end of the body is slightly curved and ends in two projections.

Life-history.—The female chafer lays her eggs in the soil by means of her pointed abdomen, usually burrowing into the soil prior to oviposition. As many as sixty to seventy eggs are laid by each female. The larvæ emerge in a few weeks' time, but the severest damage is committed after the first year. The larval existence is three years, and may remain over for four years, and when fully grown the larva pupates in an earthen cell from 6 to 15 inches deep in the soil. The adults emerge in the following May and June and feed on the foliage of many trees, especially oaks, and shrubs. The larvæ feed on the roots of many plants, e.g. fruit trees and bush fruit, strawberries, potatoes, and many plants both cultivated and wild. The damage to Rhododendrons consists of the gnawing through the fibrous roots and stripping off the epidermal layer of the larger roots.

Remedial measures.—The larval stage of this pest is an extremely difficult one to deal with in large shrubberies and nurseries on account of their position.

(i) Shaking the chafers on to tarred boards on dull days will prove a successful manoeuvre. In dull weather these chafers are very sluggish in their habits, and if the branches are shaken by means of a long cane the beetles will fall to the ground, where they can be collected and destroyed.

(ii) The larvæ can be killed by the introduction of carbon bisulphide into the soil. One ounce is sufficient for each square yard, and should be placed in the soil to a depth of 6 to 9 inches by means of an injector, taking care that the liquid does not directly come into contact with the larger roots. It is essential that the soil be in a fairly dry condition, otherwise the fumes will not permeate through the soil particles.

(iii) When bushes are being moved any larvæ that are found should be collected and destroyed.

THE AZALEA LEAF-MINER, *Gracillaria azaleella* BRANTS.

A careful watch should be kept on Azalea plants, especially those which are being forced in hot, well-lighted houses, for the Azalea Leaf-miner. This Tineid moth is a native of Japan, and has been introduced into Belgium, Holland, and the United States on imported plants.

It was first observed in Holland by BOS in 1912 on young plants of *Azalea indica*. TRIMBLE * gives an account of this pest and deals with remedial measures.

This species has not been found on plants other than varieties of ornamental Azaleas, and then committing serious injury only to those plants which are used for forcing, e.g. *Azalea verrucosa*, *A. Hinodigiri*, and *A. grandiflora* and their varieties.

Description.—The moth is a delicate creature with a wing expanse of $\frac{3}{4}$ inch, the fore-wings are yellowish with purplish areas and spots, whilst the hind-wings are light grey with a conspicuous fringed edge.

The larva is about $\frac{1}{4}$ inch long when mature, and yellowish.

Life-history.—The moths lay their eggs on the under side of the leaf close to the midrib, where they are partly hidden in the pubescence. The larvæ turn over the tips of the leaves, fastening them down by means of silken threads. They feed on the epidermis, with the result that the leaf withers and turns brown, resembling an attack of *Gracillaria syringella* F. on Lilacs and Privet. Pupation takes place on the leaves or small twigs, wherever there is a little protection.

Remedial measures include (i) hand-picking the infested leaves and burning them; (ii) hydrocyanic acid gas fumigation gave good results in America, when 90 to 95 per cent. mortality occurred in the larval and adult stages, but a second fumigation was necessary to kill the larvæ after hatching, as the gas did not harm the pest in the egg stage; and (iii) spraying is essential when a large number of plants are affected, the best wash for the purpose being lead arsenate, using 1 lb. of paste to 12 gallons of water.

My thanks are due to Mr. N. K. GOULD for the photographs illustrating this article.

* *Entomological News*, xxxv. No. 8, Oct. 1924, pp. 275-279.

CONTRIBUTIONS FROM THE WISLEY LABORATORY.

XLVI.—A DIE-BACK OF RAMBLER ROSES DUE TO
GNOMONIA RUBI *Rehm*.

By W. J. DOWSON, M.A., F.L.S.

1. *Introduction.*

IN June 1921 the Director drew my attention to an extensive die-back among two clumps of rambler roses growing near the river bank on the side of the path leading to his house, and requested me to make as complete an investigation as possible of what appeared to be a serious disease of these plants.

The present paper embodies the observations made and the results obtained from June 1921 to October 1924 which are likely to be of interest to growers. Up to the present no other instance of this disease has come before my notice, although the parasitic fungus involved appears to be widely spread. Probably the peculiar conditions under which the rambles were growing at Wisley towards the end of the war account for the serious nature of the damage sustained.

2. *Situation of the Attacked Roses.*

The clumps of rambles near many bushes of wild rose, brambles, and broom. This proximity of the wild to the cultivated plants is important when the origin of the disease is sought for, and will be referred to again. The two clumps of rambles consisted of about twelve plants—four each of such varieties as 'American Pillar,' 'Lady Gay,' and 'Minnehaha.'

3. *Description of the Disease.*

IN June 1921, long (5 to 6 feet) shoots of the rambles were dead and black, whilst the leaves of others were yellowing and falling. On the distal blackened portions of the dead shoots fructifications of more than one fungus were evident. Closer inspection showed that here and there, and particularly at the transition from diseased to healthy parts, the black discoloration gave place to areas of an ashen-grey hue several inches in length. These grey areas invariably bore the remains of one or more dead buds (fig. 41, B).

The healthy tissue was separated from the dead by a vivid reddish-purple area, extending for a few inches from the dead greyish portion through the diseased but still living tissue to the healthy green parts. The line of demarcation between the healthy green of the shoots

and the purple red of the advancing edge of the dying back portion was very pronounced (fig. 41, c). The epidermis of the ashen-grey areas had cracked in many places, and during December and the early spring of 1922 it cracked open still more.

Numerous minute pimples developed on the grey areas (fig. 41, p), and by March 1922 had produced black hair-like structures, which later proved to be the fructifications of a fungus. During 1922 the die-back spread slowly until the shoots were killed down to the ground level.

4. Examination of Diseased Shoots in the Laboratory.

In the meantime a number of diseased shoots cut off well below the purple-red discoloration had been removed to the laboratory for microscopic examination. Some of the dead and black areas were split longitudinally and kept for some days in a damp chamber. Several of the ashen-grey areas were cut out and treated in the same manner. After several days fructifications of fungi developed on all the pieces: those on the black portions turned out to be a species of *Cytospora*, while an ascomycete with minute, black, long-beaked perithecia developed on the ashy-grey portions.

On splitting lengthwise a portion of a diseased shoot it was found that the dead portion, grey on the outside, corresponded to a brown interior—cortex, wood, and pith all being stained brown. Further down, i.e. towards the advancing edge of the diseased tissues, only the cortex and wood were discoloured; beyond this only the wood was stained brown, while the pith and cortex appeared normal in hue. The actual edge of the reddish-purple discoloration, as seen on the outside, did not penetrate further inwards than the epidermis.

Transverse and longitudinal sections of the diseased shoots taken just above the junction of the healthy and diseased tissues were cut and stained in (a) Bleu Cotton G4B dissolved in lactophenol,* and (b) Gentian Violet with Congo Red as a counter-stain. Both sets of stained sections revealed a fairly copious, septate mycelium chiefly confined to the xylem elements, which contained numerous hyphæ very variable in thickness—1 to 12 μ in diameter. The finer hyphæ occurred mostly in the tracheids and medullary rays. A little higher up, i.e. in the quite dead portion, the mycelium could be found throughout the cortex, vascular cylinder, and in the discoloured pith as well. The advancing edge of the mycelium was confined to the larger vessels, and was some way behind that of the reddish-purple discoloration on the exterior.

The development of the mycelium in the water-conducting elements before the other tissues are invaded resembles that of *Cephalosporium Asteris* in the stems of Michaelmas Daisy suffering from wilt.†

* KLEBAHN, H., "Krankheiten des Selleries." *Zeitschr. f. Pflanzenkrankh.*, 20, p. 23 (1910).

† DOWSON, W. J., "The Wilt Disease of Michaelmas Daisies." *Journ. Roy. Hort. Soc.*, 48, p. 38 (1923).

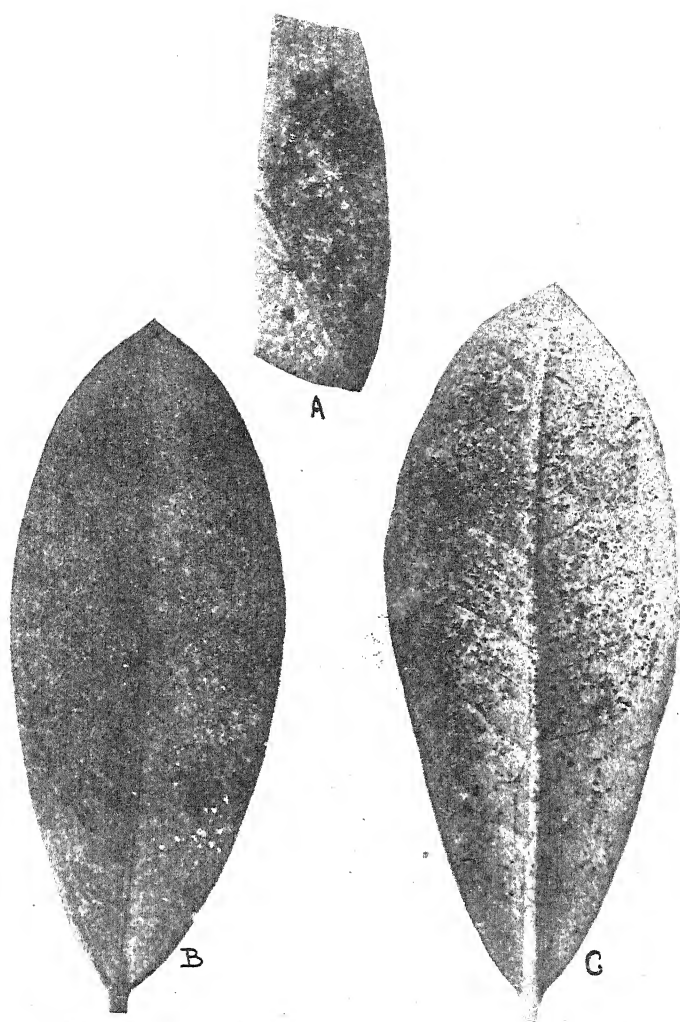


FIG. 38.—RHODODENDRON FASTUOSUM ATTACKED BY RHODODENDRON BUG.
(A) Nymphs clustered on lower surface of leaf. (B) Showing the mottled upper surface. (C) Showing the chocolate-spotted lower surface.

[To face p. 56.

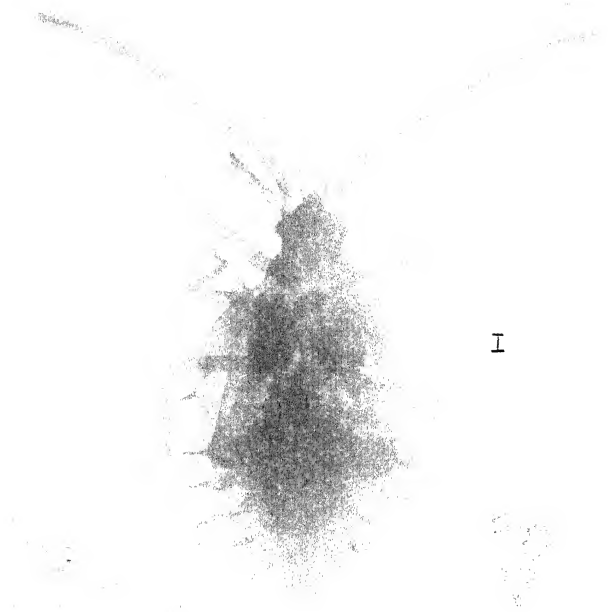


FIG. 39.—RHODODENDRON BUG (half-grown).

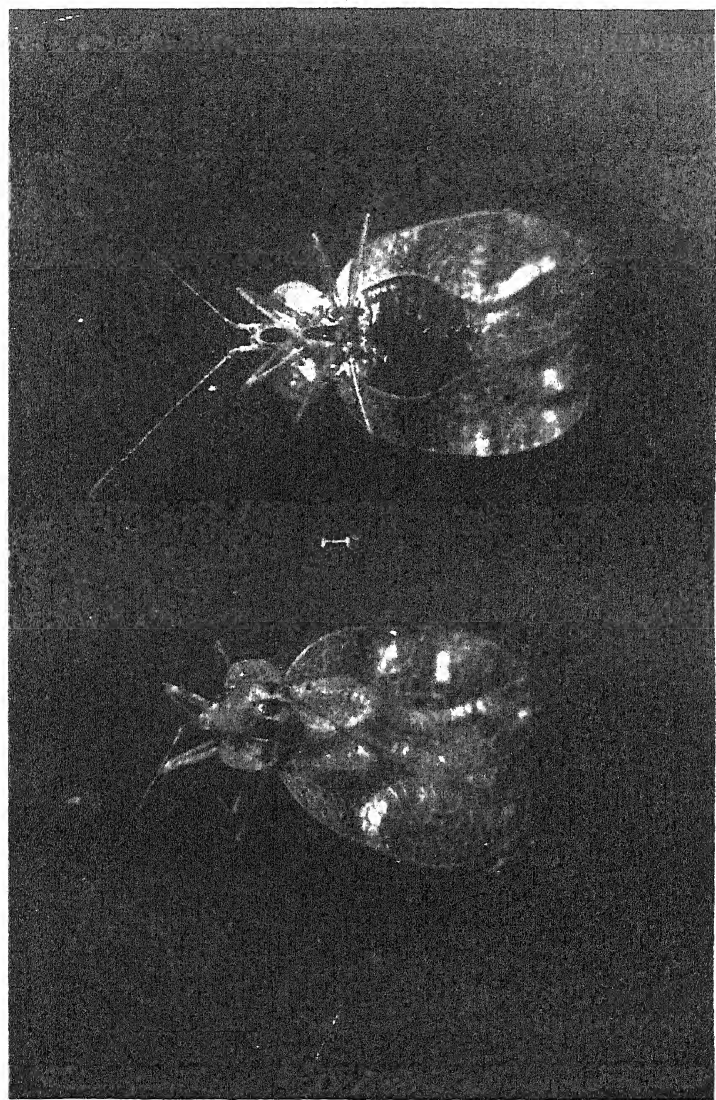


FIG. 40.—THE ADULT RHODODENDRON BUG (*Stephanitis rhododendri*).
(Upper and under view.)

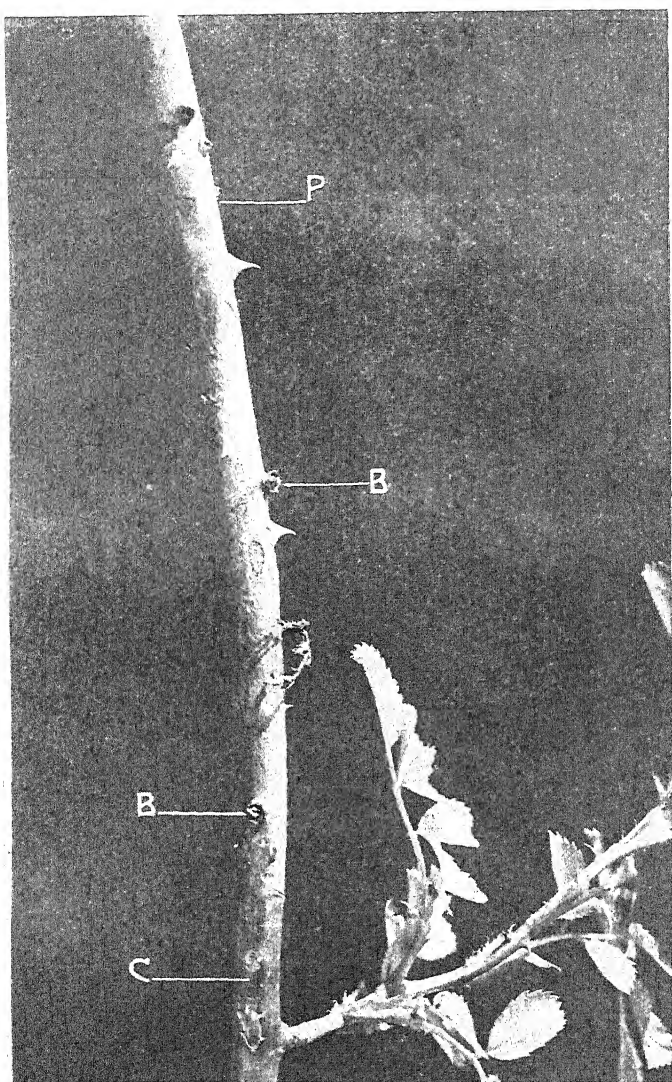


FIG. 41.—DISEASED SHOOT OF ROSE 'AMERICAN PILLAR.'
B. Dead buds. C. Red discoloured bark. P. Perithecia of fungus.

[To face p. 57.]

5. *Isolation of Two Fungi.*

On the pieces of shoots kept in damp chambers (see above) two fungi developed fructifications. That on the darkest portions of the dead shoots was soon recognized to be a species of *Cytospora*, and was obtained in pure culture from poured plates of the pycnospores. The other, on the ashy-grey areas, slowly formed black, long-beaked perithecia which did not mature for several weeks, so that at the time the *Cytospora* was isolated it proved impossible to obtain the ascomycete in pure culture by means of the spores.

The brown pith, however, taken under as aseptic conditions as possible from (a) the ashen-grey areas, and (b) the advancing edge of the die-back, when placed upon potato-broth agar gave rise to a very characteristic mycelium (the first isolation was made on June 21, 1921). This mycelium, white at first, gradually changed colour to a yellowish grey in the central portions, and produced a growth with a very irregular outline, fig. 42 (for details see later under Section 8, "Growth Characters"). In four to five weeks this mycelium commenced to form fructifications identical in appearance with those already produced on the pieces of shoots in the damp chambers (see above). On September 6, 1921, a similar mycelium was again isolated from the pith of diseased shoots.

Inoculations of healthy shoots of ramblers, brambles, and wild rose were next carried out. Both the *Cytospora* and the ascomycete were used at first, but after the conclusion of the first series, in which the former produced no effect, further inoculations were carried out with the latter fungus only.

The inoculations were commenced towards the end of 1921 and were repeated at intervals throughout 1922, 1923, and 1924. They are described in detail below.

6. *Infection Experiments.*

Rambler roses growing at the extreme northern boundary of the garden, and therefore at some distance from the two diseased clumps, were used for Series 1 (see below). Next, some potted plants of the varieties 'Goldfinch' and 'François Guillot' were inoculated in the greenhouse. Bushes of wild rose and bramble both close to, and at some distance from, the original rambler clumps were also used. Finally, the original ramblers themselves were chosen, all the previously attacked shoots having been cut out.

Series 1.—On November 22, 1921, the following three sets of inoculations were made:

A, with mycelium from a culture isolated from the pith of a diseased rambler on September 6, 1921. An 'American Pillar' was chosen and, in order to facilitate handling, some of the spines were removed. A leaf was cut off with its axillary bud, and a deep cut was made just below the origin of the bud. The mycelium and a little agar were

inserted into three such cuts on three separate shoots. The wounds were afterwards wrapped round with tinfoil held in position by the string of a small label. A fourth branch was treated in a similar way, except that agar only was inserted to serve as a control.

Early in January 1922 these inoculations were examined, when a definite dark red discoloration was observed extending beyond the edges of the tinfoil on the three inoculated shoots.

On January 24, 1922, the discoloration had increased for some distance on either side of the tinfoil band.

On April 11, 1922, the inoculated shoots were dead from the wound to the tips, and the dark discoloration was spreading towards the base of the inoculated shoots, i.e. some distance beyond the original place of inoculation. The wound of the control branch healed up.

B.—In the same way three other branches were inoculated with the *Cytospora* mycelium, and a fourth was wounded as a control. No infection took place and all four wounds healed up.

C.—One green shoot was chosen about 3 feet long, still bearing leaves, and was sprayed by means of an atomizer with a suspension of asci in a little water obtained from the petri dish culture referred to above. From another similar branch the leaves and buds were cut off and the cortex was slashed in many places with a sharp scalpel. This was also sprayed with a suspension of asci in water. No infection was obtained in either instance, which might be explained by the assumption that the inoculum was non-infectious, as it consisted of immature ascospores.

Series 2.—Using a suspension of asci and ascospores obtained from grinding up perithecia which had developed on an infected rambler shoot cut off and kept in a damp chamber in the laboratory, three long shoots of a rambler were selected and inoculated in the following manner on January 24, 1922: (1) through an incision on the stem; (2) on the wound left when a leaf and its axillary bud had been cut off level with the surface; (3) into an incision made after similarly cutting off a leaf and its bud; and finally (4) a shoot treated as (1) but not inoculated to serve as a control.

On April 11, 1922, signs of infection were apparent in the first three.

On August 17, 1922, the shoots above the places of inoculation of (2) and (3) were quite dead and black. The purple-black discoloration had extended downwards towards the bases of the branches. These two shoots were then cut off below the places of inoculation, taken into the laboratory, and placed in cylinders containing a little water to see if perithecia would develop later. (1) had been pruned off inadvertently and was therefore lost.

On October 2, 1922, mature ascospores were obtained from rather short-necked perithecia which had formed on one of the two shoots taken into the laboratory. The wound on the control branch (4) healed.

It is to be noted that in this series the inoculum was not a pure culture, bacteria being present, but the same symptoms appeared on all the inoculated branches and similar fructifications were formed on one of them.

Series 3.—Using ascospores and asci in water obtained from a flask culture on steamed rambler stems made on March 2, 1922, the following inoculations were made on April 11, 1922 :

(1) Three young shoots on the same long branch of a rambler were cut off level with the surface and a drop of the inoculum was placed on the cut surface of each. The wounds were covered with tinfoil as before.

(2) On the same bush another long branch was selected, and two holes were made with a sharp scalpel in the stem at or near the origin of a lateral shoot. The inoculum was introduced into these holes, which were subsequently covered over in the usual way. On another bush a dead bud, killed probably by frost, was removed, and the cavity thus exposed was inoculated as before. No infections took place in any of these six inoculations, possibly because the material used was immature. On April 25 asci and ascospores taken from the same culture which had provided the inoculum for the six inoculations were plated out. The ascospores did not germinate until eleven days afterwards.

Series 4.—On May 8, 1922, some roses of the variety 'Goldfinch,' cuttings of which had been struck in the previous autumn, were potted up, placed in the greenhouse, and treated in the following way :

On one plant two shoots were wounded by making incisions with a scalpel. Into one of the incisions a little mycelium taken from the same flask culture (see Series 3) was inserted and covered over with tinfoil. The other incision was not inoculated and served as a control. On another plant two shoots were selected, wounded in a similar manner, and inoculated with material from the same source. No infection followed, possibly because the mycelium was too old.

Series 5.—This was a repetition of Series 3. Using the same material two more plants of 'Goldfinch' were inoculated on May 31, 1922. No infection followed.

Early in June 1922 the fungus was recovered from one of the first series of inoculations (Series 1A of November 22, 1921 (see p. 57)) by placing slips of discoloured cortex taken from below the place of inoculation on to a potato-broth agar plate. The same characteristic yellowish grey mycelium with irregular, feathery outline (see fig. 42) grew out from these slips and was obtained in pure culture on June 12, 1922.

Series 6.—Using the mycelium from a culture of the recovered fungus (see above), two shoots of a plant of 'Goldfinch' were inoculated through two deep, oblique cuts in the stem on June 27, 1922.

On July 16, 1922, i.e. after nineteen days, the leaves above the inoculation wounds on both shoots turned yellow and a reddish area was developed round the wounds. The discoloration extended slowly

beyond the edges of the tinfoil wrappers and the leaves finally dropped. Infection had taken place, but did not spread very far.

Series 7.—Using the same culture of the fungus as before (reisolation of June 12), a potted plant of 'Goldfinch' and two potted plants of 'François Guillot' were treated as follows on July 6, 1922:

Cuts were made in two shoots of the first and in a shoot each of the latter—one being young and succulent, the other somewhat older. The cuts extended into the pith. The first was not inoculated and served as a control. The other three (one on 'Goldfinch' and two on 'François Guillot') were inoculated. All the wounds were covered over with tinfoil.

On July 16, i.e. after ten days, a reddish area extending beyond the tinfoil was visible on the inoculated shoot of 'Goldfinch.' The discoloration spread very slowly afterwards, but the shoot was not killed. The young inoculated shoot of 'François Guillot' bent over at the wound on this date; the distal portion turned black by July 28, and was dead as far as the cut on August 16. On the older inoculated shoot of 'François Guillot' a reddish area round the wound and extending beyond the tinfoil was visible on July 16. The leaf just above the cut wilted, and by August 16 the shoot was dead and black. On August 25 the dead zone had extended some way beyond the place of inoculation. The wound on the control shoot healed and no infection took place.

Series 8.—Using the mycelium of a sub-culture of the reisolated fungus (June 12), shoots of brambles and wild rose growing near the infected ramblers were inoculated through deep cuts extending to the pith on July 29, 1922. Three shoots of bramble and three of wild rose were thus treated: in addition one of each was cut as described but not inoculated, and served as controls.

One of the inoculated wild rose shoots was cut down inadvertently during clearing operations and was lost. The characteristic purple-black discoloration had appeared on the other two by August 17, and had extended considerably by the 24th.

On August 17 nothing unusual was visible on the three inoculated bramble shoots, but on August 24 black streaks extending on both sides of the tinfoil covering were to be seen on two of them, though this was not accompanied by any wilting or yellowing of the foliage.

The wild rose plants became infected and exhibited the characteristic discoloration of the shoots after twenty days, but the bramble shoots did not show similar symptoms of discoloration, followed by die-back, until eight months had elapsed from the time the inoculations were made. One of the bramble shoots thus killed was brought into the laboratory and kept in a cylinder containing a little water. Perithecia similar to those already produced on ramblers were formed on this shoot later. The two wounded controls were not infected.

Series 9.—Potted plants of 'Goldfinch' and 'François Guillot' growing under glass were inoculated as follows:

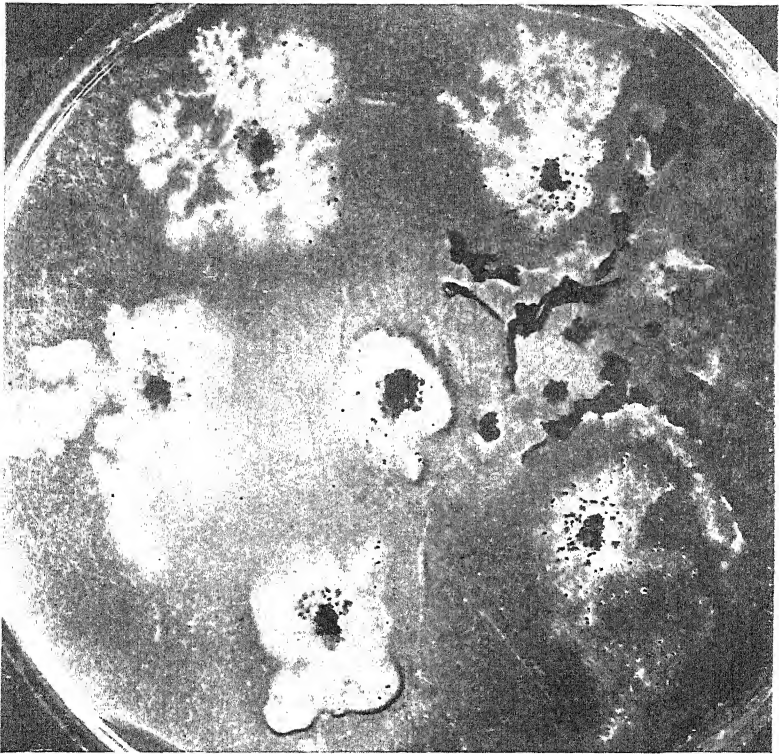


FIG. 42.—OLD PLATE CULTURE OF GNOMONIA RUBI.
Showing perithecia and feathery outline of growths.

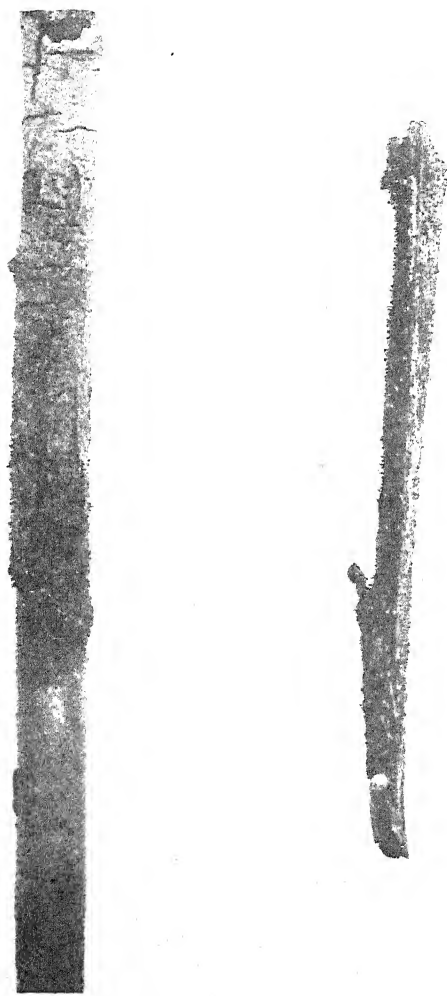


FIG. 43.—LEFT: SHOOT OF RAMBLER ROSE ATTACKED BY DIE-BACK.
RIGHT: STEAMED SHOOT ARTIFICIALLY INOCULATED.
Both show perithecia of *Gnomonia Rubi*.

Three shoots of the first and two of the second were inoculated with mycelium taken from a sub-culture of the reisolated fungus (June 12) through incisions in the stems on August 3, 1922. One shoot of 'François Guillot' was wounded but not inoculated, and served as a control. On August 16, i.e. after thirteen days, one of the inoculated shoots of 'Goldfinch' exhibited a darkened area extending beyond the edges of the tinfoil. On August 25, i.e. after three weeks, some leaves turned yellow and dropped on all the inoculated shoots of 'Goldfinch' and from the two inoculated shoots of 'François Guillot.' On the same date a reddish-purple area was visible some distance beyond the edges of the tinfoil on all five inoculated shoots. The wound in the control shoot healed and no sign of infection was observed.

In this series no actual die-back took place: the purple-red discoloration, although quite evident, ceased to extend after a time, and it is probable that the further development of the mycelium was arrested.

Series 10.—On September 14, 1922, six bramble shoots and two wild rose shoots, selected on bushes growing near one another in a distant part of the garden (the Pinetum), were inoculated with mycelium from the same source as in Series 9. The inoculations were made in the same way, viz. through deep incisions in the stems. Every one of the eight inoculated shoots became infected and eventually died. The first signs of infection, i.e. purple-black streaks on the brambles, reddish-purple blotches on the wild roses, were evident after five weeks in the wild roses, but not until six months had elapsed did they become visible on the brambles. The fungus was recovered in pure culture from both the bramble and the wild rose inoculations on March 19, 1923.

Thus the fungus originally obtained from ramblers when inoculated into certain ramblers took ten days to eleven weeks to produce an effect, when inoculated into wild rose took two to five weeks, and when inoculated into brambles took six to eight months to produce a similar effect.

During the autumn "foray" of the British Mycological Society at Keswick towards the end of September 1922 dead shoots of brambles growing by the roadside were collected at the south end of Lake Derwentwater. On a few of these numerous, small, black, hair-like bodies were present which closely resembled the beaks of the perithecia of the rambler rose fungus. On returning to Wisley these bodies were examined in detail and were found to be perithecia in the younger stages of development. The shoots bearing the perithecia were kept under damp conditions for a month and were again examined. Some of the perithecia now contained mature asci closely resembling, if not identical with, those already obtained from the infected rambler roses.

From this Keswick material a fungus was soon isolated and obtained in pure culture. It appeared to be identical with that already isolated from the ramblers. The following series of inoculations were next made with this Keswick bramble strain.

Series 11.—Four shoots of bramble and two of wild rose were selected on plants in the same part of the garden as in Series 10 and were inoculated, through incisions in the stems, with mycelium obtained from a culture of the Keswick bramble fungus on May 4, 1923. One shoot of bramble and one of wild rose were cut and received agar only to serve as controls to the others.

Infection in all six inoculated shoots was evident by July 19, 1923, i.e. after eleven weeks. The characteristic purple-black discoloration was developed and all died back. The two control shoots were not infected. The fungus was reisolated from one of the inoculated rose shoots on February 1, 1924.

Series 12.—On August 22, 1923, a second attempt (see Series 2) was made to produce infection through dead and wounded tissues by means of ascospores. From a long shoot of a potted plant of 'Goldfinch' under glass the leaves were removed and four buds were pierced by a red-hot needle, whereby some of the tissues were killed. A suspension of ascospores in water from a flask culture of the rambler rose fungus was deposited on the wounded buds by means of a platinum loop. The inoculated places were then covered with tinfoil. By the end of the year the shoot was dead, all the inoculated buds being in the dead portion which was cut off on January 2, 1924, and placed in a little water in the laboratory. In May 1924 typical perithecia were developed at the base of the twig just above the level of the water. The ascospores derived from this source were used in further inoculations (Series 15).

Series 13.—Healthy shoots of the originally diseased ramblers were selected and inoculated with mycelium of the Keswick bramble strain. At the time of this inoculation (August 31, 1923) the two groups of diseased ramblers were showing no signs of the die-back, the dead shoots having been cut out. Four old thick shoots and four young thin shoots were each inoculated through an incision—three of each with agar and mycelium, and one each with agar only. The two last acted as controls. Towards the end of December 1923, i.e. after three months, the characteristic purple-red discoloration developed in all six inoculations, and by April 1924 all the six shoots were dead. The controls were not infected.

Thus the Keswick bramble strain had brought infection in (1) bramble, (2) wild rose, and (3) rambler roses, and had taken about the same time—namely, three months—to produce an observable effect in each.

Series 14.—On March 15, 1924, another group of ramblers in the garden was inoculated with (mycelium through incisions) the Keswick bramble strain which had already passed through wild rose (see Series 11, reisolation, February 1, 1924). Five inoculations were made on five separate shoots and one other shoot was inoculated with agar only to serve as a control.

On May 14, 1924, large, purple-red discolorations were observed extending several inches on both sides of the tinfoil covers in all five,

and later on the distal portions turned black and died. The control was not infected.

Thus the Keswick bramble strain after passing through wild rose was able to produce the characteristic discoloration in rambles one month earlier than when inoculated direct into rambles.

Series 15.—Six healthy shoots of the same group of plants as served in Series 14 were selected and were inoculated (May 14, 1924) with a suspension of ascospores derived from the ascospore inoculations of the variety 'Goldfinch' described in Series 12. The ascospores and asci obtained from this source were naturally not pure, as bacteria were present. The wounds to be inoculated were made by scorching an area about 2 inches long with a spirit lamp. The flame was allowed to play upon the portion for about one minute when the cortical tissues were evidently severely scorched. The ascospores in water were transferred from a small bottle to the scorched surfaces by means of a pipette. Four shoots were treated in this way and were covered with tinfoil bands. Two others were scorched and covered over, but received drops of sterilized water in place of the suspension of ascospores and served as controls.

On May 30, 1924, i.e. after two weeks, discoloration of the cortex was noticed in all six shoots; but whereas that of the controls was of a dark grey colour corresponding with the area of the scorched surfaces, that of the inoculated shoots was of a brown-purple hue in zones and extended some distance beyond the tinfoil covers. The foliage of one of the inoculated shoots had wilted, which may have been due to the severe scorching. The foliage of the other three appeared normal. Of the controls the foliage of one was normal, but that of the other had withered, almost certainly as the result of the scorching.

Eventually all four inoculated shoots died back, and the discoloration spread downwards to their bases. The distal portion of the control indicated above died, but the damage did not go beyond the heated portion; the other control remained healthy except for the 2 inches of burnt cortex.

At the time this series of inoculations was made, i.e. on May 14, 1924, several dead buds and young shoots were observed, the bases of which on the green main shoot were marked with purple discolorations. Thinking that these might be natural infections of the die-back fungus, several were cut off, together with a little of the healthy green main shoot attached, and were brought into the laboratory, where they were kept in test-tubes containing a little water. *Botrytis* developed on most of them, and it is probable that all these lesions were due to the attack of this fungus, as the weather conditions at the commencement of May 1924 were favourable for infection by *Botrytis*. On none of the shoots did the rambler die-back fungus appear.

The above inoculations may be summarized in the form of a table. Mycelium was used in all but the last.)

Origin of Infective Material.	Host Inoculated.	Time in Months to Produce an Effect.
Rambler	Rambler	2-3
Rambler	Bramble	6-8
Rambler	Wild rose	1
Bramble	Bramble	3
Bramble	Rambler	3
Bramble	Wild rose	3
Bramble passed through wild rose	Ramblers	2
Rambler (ascospores)	Ramblers (burnt tissue)	$\frac{1}{2}$

The series of inoculations described above, extending over a period of two and a half years and carried out in both summer and winter, lead to the following conclusions:

- (1) That the ascomycete isolated from rambler roses was the pathogenic organism causing the die-back.
- (2) That the fungus isolated from the bramble growing at Keswick was similar if not identical, and produced the same disease.
- (3) That both these forms will infect and bring about a die-back in three host plants, viz. rambler roses, wild roses, and brambles.

7. *The Identity of the Fungus Concerned.*

When the perithecia produced both on the ashen-grey pieces of killed shoots and in pure cultures were mature and were discharging ascospores the work of identifying the fungus was commenced.

The perithecia, fig. 43, are black in colour, nearly spherical in shape, and are provided with long (1 mm.) beaks covered with slightly projecting hyphæ which give them a rough appearance when seen under the lower power of the microscope. The beaks tend to become longer when produced in pure culture than those formed on naturally infected shoots, a fact which has been recorded before for this and other ascomycetes.* In fig. 45, B, the outlines of perithecia from various sources have been drawn with the aid of the camera-lucida: *a* was taken from a pure culture of the bramble strain, *b* from a naturally infected rambler shoot, and *c* from a pure culture of the rambler strain. The measurements of these are as follows:

<i>a</i>	300 × 350 μ	the beaks	700 and 840 μ
<i>b</i>	280 × 350 μ	„	210 μ
	400 × 420 μ	„	170 μ
<i>c</i>	280 × 280 μ	„	210 μ
	350 × 420 μ	„	560 μ

The beak is rather narrow and the opening at the apex is less than the diameter of a mature ascus (see below). Numerous asci are

* EDGERTON, C. W., "Notes on a parasitic *Gnomonia*," *Bull. Tor. Bot. Cl.* 34 (1907), and H. KLEBAHN, "Untersuchungen über einige Fungi imperfecti und die zugehörigen Ascomycetenformen," 1 und 2, *Jahr. f. Wissen. Bot.* Bd. 41, p. 519 (1905).

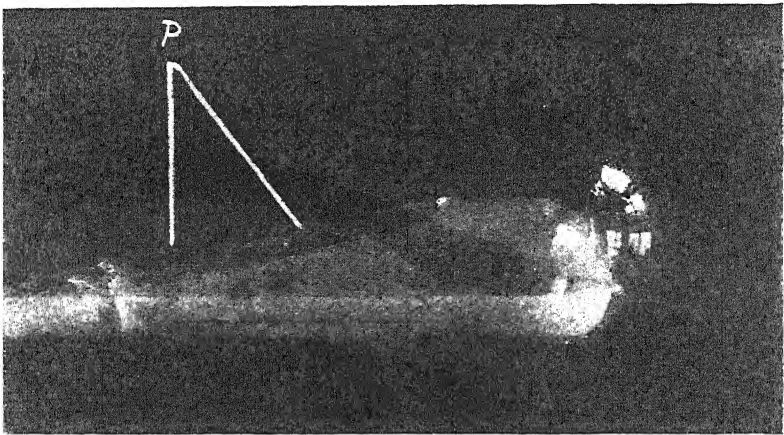


FIG. 44.—CULTURE OF GNOMONIA RUBI IN TUBE ON AGAR, SHOWING PERITHECIA (P).

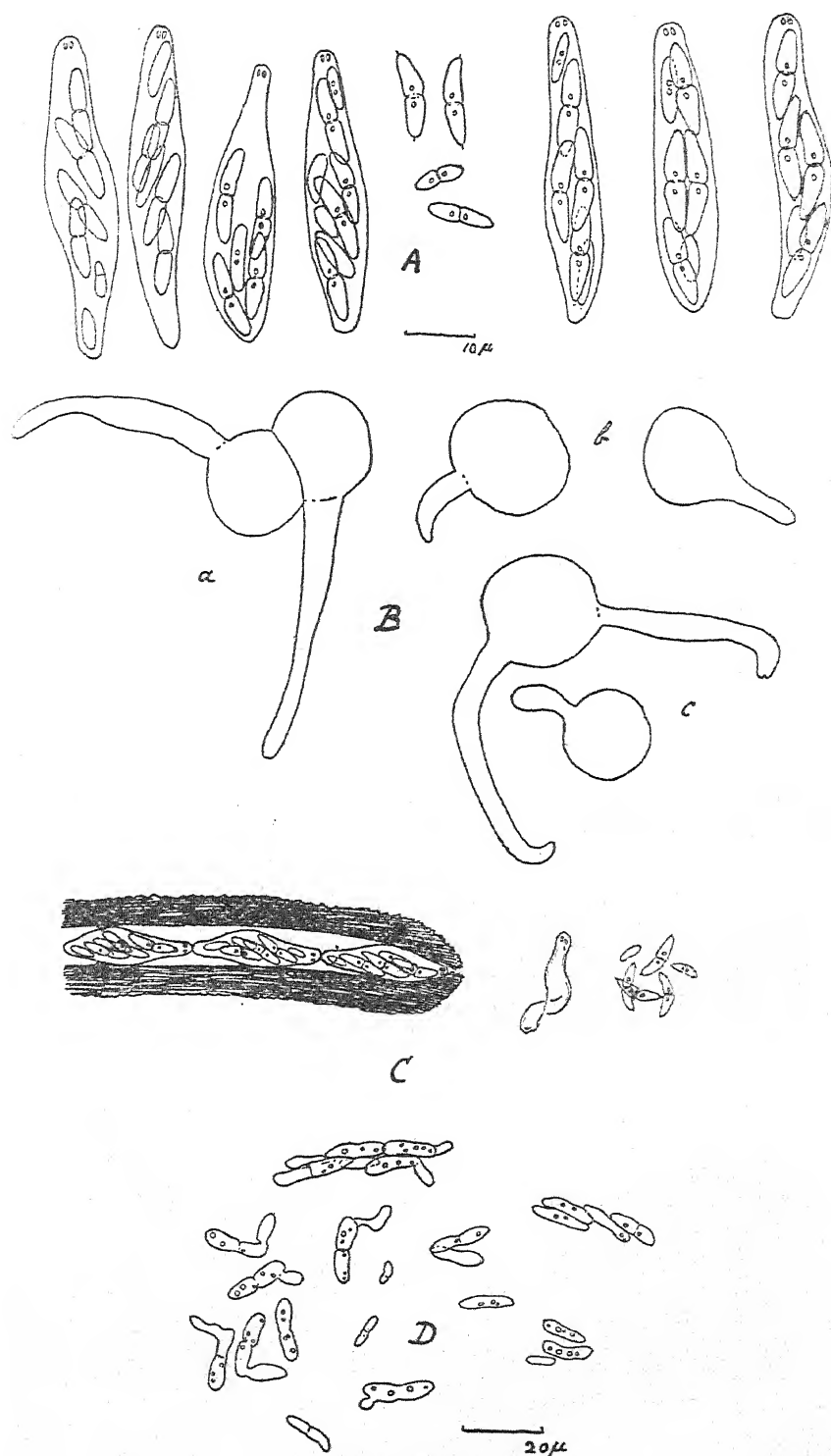


FIG. 45.—GNOMONIA RUBI. (For explanation see text.)

contained in each perithecium, mostly cigar-shaped and rounded at both ends, but occasionally club-shaped (third from left in fig. 45, A) with the greatest diameter below the middle. They are colourless, and become nearly invisible when mounted in water or dilute glycerine. The pore at the apex of the ascus is surrounded by a ring which appears as two brightly shining dots when viewed from the side.

The asci measure $38-44\mu$ long by $8-10\mu$ at the widest part. Each contains from five to eight ascospores, usually only six, two of which are smaller than the rest (fig. 45, A, right). The four large ascospores are equal in size, asymmetrical, and are composed of two equal, elongated cells with rounded ends. There is a marked constriction at the septum. The smaller ascospores are either continuous (fig. 45, A, in the asci), or one septate (fig. 45, A, centre). Two oil drops are often present, one on each side of and close to the septum. On germination (see below and fig. 45, D) these drops increase in number and are disposed erratically in the spores. When mature the four large ascospores bear short, delicate appendages, one at the end of each cell (fig. 45, A, centre), not at all easy to see and which soon vanish. The measurements of the ascospores are as follows :

The large ones, $12-14\mu$ long by $2.5-3\mu$ wide.

The smaller ones, $4-9\mu$ „ 2μ „

The general characters of the perithecia, asci and ascospores agree with those of the genus *Gnomonia*. Reference to STEVENS' "The Fungi which cause Plant Disease," 1913, indicated that a *Gnomonia Rubi* Rehm had been recorded on blackberry shoots in America by C. W. EDGERTON.* I have to thank Mr. F. T. BROOKS of the Cambridge Botany School for kindly looking up EDGERTON's paper and for sending me the details. Subsequently, Dr. E. J. BUTLER, Director of the Imperial Bureau of Mycology, was kind enough to lend me a copy of the paper in question. My thanks are also due to Miss E. M. WAKEFIELD of the Herbarium at Kew for her kindness in sending me a copy of the descriptions of REHM, WINTER, and SACCARDO. EDGERTON's drawings (his fig. 3, *a*, *b*, *c*, and *d*) of asci and ascospores correspond with some I had already made (fig. 45, A). The measurements he gives, viz. $200-260\mu$ by $175-220\mu$ for the perithecia, are somewhat less than those obtained in the present instance (see above). His ascus measurements, viz. $20-50\mu$ by $6-9\mu$, agree with mine, but the ascospores as measured by him, viz. $14-19\mu$ by $3-5\mu$, are somewhat larger.

REHM, to whom EDGERTON sent some of his material, confirmed the identification and pronounced the American *Gnomonia* found by EDGERTON to be identical with the one he had described in 1881 as *G. tetraspora* Wint. var. *Rubi* Rehm † on fallen blackberry leaves. EDGERTON states that "the asci . . . contain as a rule but four spores, though occasionally some aborted spores may be seen at the base."

* *loc. cit.*

† REHM, *Hedwigia*, vol. 20, p. 53, 1881.

These probably correspond to what I have described above as the smaller ascospores, 1-4, usually two in number.

In 1887 WINTER considered REHM's fungus to be a good species, as the only character it had in common with *Gnomonia tetraspora* Wint. was the possession of four spores in the ascus, and he therefore named it *Gnomonia Rubi* Rehm.*

SACCARDO † gives an abbreviation in Latin of REHM's original description, followed later ‡ by a Latin abbreviation of WINTER's description.

The only other reference to *Gnomonia Rubi* Rehm which I have found is a short note by WORMALD in the "Report of Economic Mycology of the South Eastern Agricultural College, Wye, for 1913-14," pp. 91-93. Besides recording the presence of this *Gnomonia* on a dead loganberry cane, WORMALD quotes largely from EDGERTON's paper and further observes that the spore measurements obtained from loganberry, viz. 12μ by 3μ , are less than those from blackberries in America. Here it may be noted that WORMALD's measurements are in very close agreement with mine ($12-14\mu$ by $2.5-3\mu$).

It may be concluded, therefore, that the fungus with which this paper deals is the same as that recorded by REHM, EDGERTON, and WORMALD; but it should be noted that the asci are not four-spored, but usually contain six spores, some only five and some as many as eight, four always being larger than the rest.

KLEBAHN § gives figures of *Gnomonia Rosae* Fuckel on fallen rose leaves, but this species is distinguished from *G. Rubi* by the possession of eight long thin ascospores arranged together in a bundle in the ascus.

8. Growth Characters of *Gnomonia Rubi*.

In plate cultures the mycelium which results from germinating ascospores, or from pieces of pith taken from naturally infected shoots, or from inoculated stems, is at first white, changing later in the centre to grey and finally to a dingy yellow. The edges of such growths are always white, very irregular and feathery (fig. 42). In tube cultures on DOX's medium, or potato-broth agar, or on BROWN's modification of SHERBAKOFF's medium, the growth is similar. There is very little aerial mycelium which is white, but considerable growth in the substratum (fig. 44), the older portions of which become yellowish.

In conical flasks containing steamed shoots of wild rose, bramble or rambler rose in a little water, a small amount of white aerial mycelium is developed on the cut ends of the shoots; a much larger quantity grows into the liquid at the bottom of the flasks, where it soon changes colour from white to dingy yellow. In old (many months) cultures the submerged mycelium becomes a chestnut-brown.

* WINTER, *Hedwigia*, vol. 26, p. 62, 1887.

† SACCARDO, P., *Sylloge Fungorum*, vol. 1, p. 562.

‡ l.c. 9, p. 673.

§ KLEBAHN, "Haupt- und Nebenfruchtformen der Ascomyzeten," Erster Teil, 1918, fig. 141, p. 215.

Perithecia were developed on all the media tried (those mentioned above and, in addition, cooked rice), and commenced to be visible to the unaided eye after about one month from the time of inoculation. The time these bodies take to appear depends upon the nature of the medium, its depth and the amount of moisture present. Thus, on deep potato-broth agar plates the growth was much more rapid and more perithecia were formed than on thin plates of the same agar. Plates of any medium containing only a thin layer often dried out after the production of a few perithecia. In tube cultures containing slopes of various media, perithecia were developed sooner and were more numerous than in any other agar cultures. Moreover, the perithecia were formed in the mass of the substratum as well as upon the surface (fig. 44). On the steamed shoots of the flask cultures very numerous perithecia were developed, often after a few months, so that on holding up the flasks to the light the shoots had the appearance of being covered with fine black setæ (fig. 43). Fig. 43 shows a steamed rambler shoot (right) taken out of its flask for the purposes of photographing; on the left is a piece of rambler, naturally infected, taken from the garden in February. After taking the photograph the latter shoot was placed in a measuring cylinder containing a little water at the bottom, the surface of the liquid being just below the place where the perithecia had developed. In one month's time the whole of the grey and cracked portion was studded with the projecting beaks of the perithecia, and resembled in this respect the development in the flask cultures.

In nature the perithecia are not nearly so numerous (fig. 43, left). No conidial stage has been produced in pure cultures, and no conidial form on rambler roses, wild roses or brambles has been connected with *Gnomonia Rubi*.

The liquid filtered off from the flask cultures was tested for possible toxic effects on chlorophyll-bearing organs (green shoots and leaves) in the same way as was the Aster wilt fungus, *Cephalosporium Asteris*.* Shoots of rambler rose, wild rose, and bramble, bearing foliage, were placed in small sterilized bottles containing the filtered liquid of the flask cultures. After sixteen days a few leaves of the rambler and wild rose commenced to turn yellow and wither. Later the remaining leaves did the same and a few dropped, while controls in tap-water remained quite fresh and green during the same time. As the cut ends of the shoots were not blocked by the formation of gum, the yellowing and withering of the leaves must be attributed to the transport of poisonous substances in the transpiration current. It will be recalled that yellowing and dropping of the leaves is an early symptom of the disease as observed in nature (see above).

The details of the formation of perithecia in pure culture on artificial media have not been completed, and together with the cytology of the ascus will form the subject of a further communication.

* DOWSON, W. J., "On the symptoms of wilting of Michaelmas Daisies by a toxin secreted by a *Cephalosporium*." *Trans. Brit. Myc. Soc.* vol. 7, p. 283 (1922).

9. *The Discharge of the Ascospores in Gnomonia Rubi* Rehm.

As perithecia were abundantly produced in pure cultures on agar media it was a simple matter to detach a few and to view them under the microscope. Thus on May 8, 1924, from a culture made on March 15 previously, a perithecium was removed on the point of a needle, mounted in a drop of water, covered with a slip and kept under observation through the lower powers of the microscope. The perithecium was then seen to be two fused together, as it possessed two slightly curved beaks and resembled that shown in outline in fig. 45, B. In a few minutes one of the two necks commenced to emit ascospores, which passed out, an ascus-full at a time, at intervals of a second.

The first group of spores were shot to a distance of less than the length of the perithecial beak and those following not so far, because all the spores remained in a small bunch close to the ostiole and obstructed the movement of each succeeding ejection. The discharge continued for several minutes. The asci could be seen passing along the neck one behind another, and in this particular instance the bore of the tube appeared to be no more than to allow the passage of one ascus at a time. The actual pore at the apex of the beak was obviously smaller than the girth of an ascus, for each time one passed out the pore opened slightly and then closed again.

After some minutes it was observed that asci and not ascospores were being discharged with the same clockwork regularity. The dense mass now surrounding the ostiole consisted of full asci, ascospores, and empty asci which could be readily picked out by reason of the two glistening dots in the mouth of each, the rest of the ascus being just visible as a very faint membrane. At this stage so many asci and ascospores had accumulated that it was impossible to see clearly what was happening. Another perithecium was then mounted, and this time attention was concentrated upon the ascus just as it reached the pore, to see, if possible, just how the ascospores left the ascus. This appears to take place as follows.

The ascus, which is usually cigar-shaped (fig. 45, A), reaches the end of the beak, and the thinner end pushes into the pore and there sticks for a moment, owing to the central part of the ascus being larger than the pore. Pressure from behind forces the ascus onwards through the pore, which opens just enough to allow it to pass; but before it leaves the pore the ascospores are ejected from the ascus while part of it is still in the pore. Probably the pressure exerted behind by the following asci, and that exerted on the widest part of the ascus by the edge of the pore, causes the discharge.

As the end of the beak is thicker than the lower parts and is covered with hyphæ projecting from the surface, it is not possible to see clearly what actually takes place at the pore. The asci can be plainly seen moving up the bore of the beak towards the pore, and at the opening itself, the expulsion of the ascospores, followed immediately by an

empty ascus, can also be clearly observed. Then comes a pause which is interrupted by the ejection of a further group of ascospores, at the rear of which is the empty ascus. In some perithecial beaks it was noticed that the bore is wide enough at the base to permit of 3 to 4 asci to pass abreast. In every instance observed, after several minutes the emission of ascospores, empty asci, and an occasional full ascus, was followed by the ejection of full asci only, possibly because the pore had by this time become slightly stretched. (See diagram, fig. 45, C.)

If perithecia are not mounted in water but merely kept damp, *i.e.* surrounded by a film of moisture, the ascospores, etc., do not pass beyond the film, but appear to ooze out of the pore and collect round the apex of the beak to form a colourless spherical mass. Such masses were produced in the flask cultures from the numerous perithecia formed on the steamed shoots, and appeared as small blobs about the ends of the perithecial beaks.

In preparations made of freshly ejected ascospores the tails or appendages at the ends are more easily seen than at any other time (fig. 45, A, centre). The only other knowledge I possess of the discharge of the perithecia of the genus *Gnomonia* is that kindly supplied by Mr. F. T. BROOKS, who informed me that when working with *Gnomonia erythrostoma* Pers.* he was able to collect the ascospores on the inside of a petri-dish cover from leaves bearing perithecia placed in the bottom of the dish. Thus the ascospores must have been discharged to a considerable distance.

10. Germination of the Ascospores.

In germinating the ascospores increase in size, particularly at the ends, which become swollen and rounded. The oil drops are scattered and one germ tube is produced from the end of one of the cells. A curious feature about the process is that the septum of the spores becomes very nearly invisible (fig. 45, D).

11. Observations in the Field.

Throughout the course of the investigation the originally diseased ramblers were examined at regular intervals of about a month. The greatest amount of die-back took place during the summer, but perithecia of *Gnomonia* were not found until the winter, and from actual tests made in the laboratory the ascospores germinated most readily in the spring. At this time of the year the buds are commencing to open, and at the same time night frosts are frequent.

It was noticed during the springs of 1922, 1923, and 1924, that a considerable number of opening buds had been frost-bitten, and it has been stated above that the ashen-grey areas bearing *Gnomonia*

* BROOKS, F. T., "The Development of *Gnomonia erythrostoma* Pers.—The Cherry-Leaf-Scorch Disease," *Ann. Bot.*, vol. 24, p. 585 (1910).

on the killed or dying shoots invariably bore the remains of one or more killed buds (fig. 41, B). From these observations it may be inferred that infection takes place through the frost-bitten buds, an assumption which is strengthened by the inoculation experiments described above (see Series 6 and Series 15). In these both buds and shoots were destroyed by heat and inoculated with ascospores which led to infection.

Though constant search was made both in the immediate vicinity of the diseased ramblers and in other parts of the garden, neither brambles nor wild roses have been found infected with *Gnomonia Rubi*: but, as recorded above, the fungus was collected on bramble at the south end of Lake Derwentwater. Dr. WORMALD informs me that he has had no experience of this *Gnomonia* other than that which he recorded in 1913 on dead loganberry cane (alluded to above). *Gnomonia Rubi* Rehm, therefore, seems to be widely distributed but not at all common.

12. The Probable Course of the Disease.

From the observations in the field and in the laboratory, and from the infection experiments, it is possible to describe the probable course of the disease in nature. It may be assumed that *Gnomonia Rubi* was originally present on bramble, and perhaps also on wild rose, and that the fungus passed on to the ramblers from the wild plants at some period when all three were growing in contact with each other.

The perithecia discharge their spores during the time the buds are commencing to open, and at the same period frosts are responsible for the death of many of these young growths. The ascospores, washed by rain or heavy dew on to some of the killed buds, germinate there on the dead tissue. The woody cylinder is invaded first, then the cortex, and finally the pith. There may be more than one infection on any given shoot. The result is the same in the end: the leaves turn yellow and fall, probably due to the action of toxic substances, and the shoots are girdled and die right back to the ground.

As mentioned above, this disease of rambler roses has, so far, only been observed at Wisley; but this does not mean that it does not occur elsewhere. From the known distribution of *Gnomonia Rubi* and its host plants, including bramble, wild rose, rambler rose, and loganberry, it is probable that given the right conditions serious damage may result to cultivated varieties of *Rubus* and *Rosa*.

In conclusion, it is a pleasure to record my thanks to my colleague, Mr. N. K. GOULD, for preparing the admirable photographs.

13. Summary.

A die-back of rambler roses ('American Pillar,' 'Minnehaha,' and 'Lady Gay') due to *Gnomonia Rubi* Rehm is described. The same fungus has also been found on the bramble.

Various climbing roses, wild roses, and brambles were artificially infected with both the rambler strain and the one obtained from the bramble.

In nature the ascospores are discharged at the same time as the buds unfold. Frosts are also common at this period and are responsible for the death of many of the buds. It is considered from the readiness with which the ascospores will infect killed tissues, including buds, that in nature infection takes place by means of ascospores germinating on the frost-bitten buds.

The discharge of the ascospores from the perithecia is described in detail.

The characters of the growth in pure culture on various media of *Gnomonia Rubi* are described, together with the asci and ascospores.

NOTES ON JAPANESE CHERRIES.

By COLLINGWOOD INGRAM.

ALTHOUGH the Japanese ornamental Cherries are among the most beautiful of all flowering trees, they are still strangely neglected in English and European gardens; indeed, only a very small proportion of the known varieties can now be obtained in this country. There can be but one explanation for this apparent indifference: the almost hopeless confusion that now exists with regard to their nomenclature.

From time to time collections have been imported from Japan. These, of course, always arrive carefully labelled, but in my experience it is the merest chance if the plants have been correctly named. If the same variety has come into this country under half a dozen different Japanese names, how are we to know what to call it?

It is in the hope of throwing some light upon this subject and of stabilizing, as far as possible, the nomenclature of these Cherries that I have written the following notes. Unfortunately they are very far from being complete. In fact, they refer to scarcely a third of the number of varieties recognized by horticulturists in Japan, but I have deemed it advisable to describe only such sorts as I have been able to determine more or less to my own satisfaction. My collection contains many more varieties that have not yet flowered, and I hope to be able to give a supplementary list of these at some future date.

My identification of these Cherries has been based on the painstaking and elaborate works of Prof. MANABU MIYOSHI. In his "Die Japanischen Bergkirschen, ihre Wildformen und Kulturrassen" (*Journ. Coll. Sc. Tokyo Imp. Un.*, vol. xxxiv., March 10, 1916) he has described, at length, something like 133 species and varieties, many of which are beautifully and faithfully figured in colour. A later work by the same author illustrates 118 forms, but unfortunately the text of this fine monograph is in Japanese, and is therefore inaccessible.

By a curious coincidence, Mr. E. H. WILSON's interesting paper on "The Cherries of Japan" (*Publications of the Arnold Arboretum*, No. 7, March 30, 1916) appeared in America only a few weeks after MIYOSHI's "Die Japanischen Bergkirschen." The latter work, therefore, antedates WILSON's, and has to be followed so far as nomenclature is concerned. It is unfortunate that most of WILSON's names have to fall, as a good many people have been working with his "Cherries of Japan," whereas MIYOSHI's monographs, one written in German and the other in Japanese, are virtually unknown.

Prior to these works G. KOIDZUMI, in his "Conspectus Rosacearum Japonicarum" (*Journ. Coll. Sc. Tokyo Imp. Un.*, vol. xxxiv., Oct. 28, 1913), had described and named a number of Cherries, but his

descriptions are often too brief to be of any real use. But in accordance with the laws of priority, in all cases where there can be no doubt as to the variety referred to, I have invariably used KOIDZUMI's name in preference to MIYOSHI's. When I have failed to find the variety described by either of these authorities, I have followed WILSON, as being the next earliest writer to give serious attention to these Cherries. In the few instances where I have been unable to find even an approximately suitable description in any of the above works, I have been obliged to give the variety a new name. I do not suggest for a moment that these are really new varieties, but I maintain that it is better to rechristen a plant than to run the risk of bestowing upon it a name already occupied.

Space, of course, has been devoted to these Cherries in other works, but the three mentioned above are the latest and the most comprehensive.

I do not hold altogether with MIYOSHI's division of the species, and therefore am not following him slavishly in this respect. Broadly speaking, his plan seems to be: "When in doubt, if it be a single-flowered Cherry, call it *Prunus mutabilis*; if a cultivated form, call it *P. serrulata*." With regard to the latter, I think, perhaps, he is right, for the parentage is often merely conjectural. In a few of the horticultural varieties it is, no doubt, quite easy to suggest a parent, but in the vast majority—forms that have been in cultivation for hundreds of years—it is idle to hazard a guess. But under *P. mutabilis* MIYOSHI has collected together a very dubious and heterogeneous assembly of single forms. I have not sufficient material at hand to say how many of these are truly spontaneous, or to express an opinion as to the advisability of giving some of these Cherries specific rank. A few, undoubtedly, will have to be separated as species. The broad-leaved, white-flowered *P. speciosa*,* for instance, can have nothing to do with the narrow-leaved, pink-flowered *P. mutabilis stricta*† (fig. 46). I have therefore dissociated these two plants in the present paper.

In his "Die Japanischen Bergkirschen," MIYOSHI includes only four species, *P. mutabilis*, *P. sachalinensis*, *P. serrulata* and *P. fruticosa*,‡ but in his later work he increases this number to ten without including *P. incisa*, *P. Maximowiczii*, *P. Pseudo-cerasus*, *P. nipponica* and *P. apetala*, which are amongst the ten species enumerated by WILSON.

As MIYOSHI includes *P. speciosa* with his *P. mutabilis*, the characters given in his diagnosis of the latter are far too comprehensive to

* This is *Prunus mutabilis speciosa* of MIYOSHI and *P. Lannesiana albida* of WILSON.

† *P. serrulata spontanea* of WILSON. I have used this Cherry, although of Chinese origin (see p. 79), for comparison, as it is the only one of the group I have flowered and fruited at Benenden. Until I can obtain further material, I propose to regard it as a typical example of *P. mutabilis*.

‡ *P. fruticosa* is preoccupied, so this name cannot, in any case, stand. The position of this Cherry seems very ambiguous. WILSON at first associated it with his *P. serrulata pubescens* (cf. *Ch. of Jap.*, p. 35) and later with *P. yedoensis* (*op. cit.*, Supplement, p. 1).

enable us to distinguish the species with any kind of certainty—in almost every particular they overlap those given for *P. serrulata*. This is scarcely surprising, seeing that *P. mutabilis* as understood by MIYOSHI is probably the prototype of nearly all the cultivated varieties. But in the more restricted application of the name, as used in this paper, *P. mutabilis* and its forms are not, apparently, the parent of so many varieties as *P. speciosa*.

It would have greatly simplified matters had MIYOSHI selected a single plant for type and not described the many so-called races collectively. As this should, I think, be done, I propose to select the Hupeh Cherry as the typical form of *P. mutabilis*, my reason for choosing this plant being that it is the only one I have succeeded in flowering and fruiting at Benenden.

P. mutabilis.—Leaves unfold bright copper-red, elliptic-ovate when mature; glabrous; with from six to eight veins. Serrations usually simple with very small teeth. Bark grey. Inflorescence in a two- to four-flowered corymb; flowers pink. Fruit black, nearly spherical, measuring about eight or nine mm. in diameter.

Hab. Hupeh, China. This Cherry, and its geographical races appear to differ from *P. serrulata* by the narrower form of their leaves, which usually have simple, instead of double, serrations, and fewer veins.

The flowering Cherries have probably been cultivated in Japan from time immemorial,* and many ancient books and manuscripts dealing with the subject appear to be in existence. Of these early works the most important known to MIYOSHI is one called "Kadan Komoku" written by TOSHIKATSU MIZUNO in 1681. Of the forty varieties referred to by this author twenty-one are said to be still in existence. It seems that during the following century the number of cultivated forms greatly increased, but in recent times many of these appear to have been lost to horticulture.

The Japanese—who are generally supposed to be the most æsthetic race in the world—rightly regard the flowering Cherries as the most precious of their many floral treasures. They recognize and cultivate something like 130 species and varieties, upon all of which they have bestowed endearing and poetic names. To them the tree is not only a thing of beauty but is also emblematic of loyalty and patriotism. In this connexion a quaint story has been handed down of a trusty warrior and his Imperial master which is perhaps worth repeating here.

The Emperor GO-DAIGO † had fallen into the hands of his enemies, and they held him so close a captive that the faithful KOJIMA could at first find no means of conveying to him a message of hope and encouragement. But when he learnt that the Emperor was about to be carried into exile, KOJIMA was quick to seize the opportunity that

* Double forms are known to have existed in the Nara Period, over a thousand years ago.

† The Mikado GO-DAIGO reigned from A.D. 1319 to 1339.

was offered and hastened forward by a different road. Stopping at an inn where GO-DAIGO was expected to stay, he hurriedly tore the bark off a Cherry tree, and wrote thereon his message of assurance.

This incident, which is probably true, or at least founded on fact, is often depicted in various phases of Japanese art.

As is well known, the blossoming of the Cherries is made the occasion of a national holiday in Japan, high and low alike making an annual pilgrimage to the more famous groves and plantations. Of these the most noted is at Yoshino, in the province of Yamato. It was from this district, in the year 1735, that the Shogun YOSHIMUNE ordered 10,000 trees to be removed to Koganei, near Tokyo. Some of these trees are still flourishing, and have grown into magnificent specimens 60 or 70 feet tall. There are also large numbers of Cherries in the Ueno and Shiba parks of Tokyo. At Arashiyama, in the Kyoto district, the hilly woodlands that flank the River Katsura contain great drifts and thickets of wild Cherries, and in the spring and autumn people throng thither to see them in flower or in foliage. Kohoku and Sakuragawa are two other noted localities.

There seems no real reason why we should not enjoy similar scenes in our own island. Only a few of the southernmost forms are unsuited to our climate, and the majority are quite easy to propagate and thrive on the roots of our native *P. Avium*.

Only those who have visited Japan during the spring months can realize the fairyland of beauty presented by hundreds of these Cherries in full flower. No pen can do justice to such a sight—its splendour literally takes one's breath away.

Despite the fact that the majority of these Cherries are perfectly hardy, of rapid growth and easy culture, they are hardly ever planted extensively in this country; an isolated specimen tucked away in a crowded shrubbery can never do justice to their exquisite beauty—to be seen at their best they should be massed, planted in avenues, or given space as lawn specimens.*

Although only a tithe of the known varieties are now procurable in England, a few of the finest varieties are already in cultivation, and among these may be mentioned Kanzan, usually, but erroneously, called Hisakura by nurserymen. There are, of course, several others in commerce of almost equal merit, but these will be dealt with later. When better known, the insistent charm of these flowering Cherries and their many virtues are sure, sooner or later, to create a vogue for them.

The fact that a few of the varieties appear to be more difficult to propagate on *P. Avium* than the sorts commonly met with may possibly explain the rarity of these in English gardens. But this difficulty is, after all, only relative. I believe at some time or other

* At Rochester (U.S.A.) I believe Japanese Cherries have been planted so numerously that they cover many acres of the extensive Park, while at Washington, in Potomac Park, nearly 2,000 were planted in 1906 and are already of great beauty. It is a matter of regret that none of our English municipalities has made similar use of these trees.

most of the more striking varieties have found their way into this country. Their disappearance may partly be due to the above cause, but I think it much more likely that it is accounted for by the confusion that exists, and has always existed, with regard to their names. If people knew what sorts to ask for they would, in time, be able to get what they wanted.

The question of stock is an interesting one. That frequently used by the Japanese nurserymen appears to be a weak-growing, bushy plant of dwarfing influence, called by WILSON 'Mazakura.' For this country I very much doubt its suitability, as it seems lacking in vigour and stamina, suffering severely under drought. It is apparently popular with the Japanese on account of the ease with which it may be propagated from cuttings.* Doubtless this so-called Mazakura (which is one of MIYOSHI's *P. mutabilis*) induces early flowering in the resultant plant, but this in itself is not of sufficient value to compensate for its many other defects. One can scarcely expect to grow a long-lived and a large tree on the roots of a shrubby plant.

WILSON suggests that *P. sachalinensis* is an ideal stock for the larger-growing ornamental varieties. Seedlings of this North-Japanese Cherry are at present virtually unprocurable in England, and I confess that I have had no opportunity of testing it. But from my observations of own-rooted specimens of this species, I feel sure it cannot be so satisfactory in this country as our native *P. Avium*. The latter, in my experience, is in every way a suitable stock; being indigenous, it is perfectly adapted to our climatic conditions, which remains to be proved in the case of *P. sachalinensis*. In this connexion it must be remembered that the average rainfall in Japan is very considerably more than in England, in fact in many places it is nearly double. Even varieties of *P. subhirtella* seem to thrive better in my rather cold and stiffish soil on the roots of *P. Avium* than they do on those of their wild type. The stock and scion being sometimes of unequal vigour, in order to obviate any possibility of an unsightly constriction of the trunk, it is always advisable to work the grafts or buds as near the ground level as possible—moreover, they seem to do better when so worked. I have noticed that, with a few of the less hardy varieties, when very young the bark is liable to frost injury close to the ground, but with age this disability apparently disappears, and can, in any case, always be overcome by placing straw envelopes or some other protection round their stems during the first few winters of their life.

With regard to the culture of these Cherries little need be said, as it presents no real difficulties. A rich, open soil and a sunny position are, of course, desirable, but so long as the drainage is good and there is a sufficiency of moisture at root they will grow almost anywhere.

* WILSON says at grafting time the severed tops are merely inserted in the ground and form stocks for the following season. I very much doubt if the cuttings will root so freely in this country. Mazakura is not the only stock used by the Japanese, and I have seen imported plants worked on what appears to be seedling *P. speciosa*, a much more vigorous grower.

In the following notes I have given a few measurements of the flowers. These measurements must not be regarded as constant, but merely typical of the variety described. The same remark applies also to some of the other details supplied. For instance, the colour, size, and even the shape of the leaf, may differ in response to external conditions, light and the vigour of the individual plant being potent factors in this respect. The length of the peduncle is another variable character, depending largely on whether the flowers appear before or after the foliage; the peduncle is always appreciably longer when the latter is the case.

But all these variations have their limits. It is hoped, therefore, by describing only the outstanding characters of typical examples, growing side by side, that these notes will serve as some sort of a guide to the identification of these beautiful Cherries.

Before concluding I would like to offer thanks to my many friends and correspondents in different parts of the world. Without their generous help it would have been quite impossible for me to have assembled the collection of nearly seventy varieties of Japanese flowering Cherries that are now growing at Benenden, forty of which are here described.

I. SARGENT'S CHERRY.

Prunus sachalinensis, Fr. Schmitt.

Syn. *P. sachalinensis* f. *typica*, Miyoshi.

P. serrulata sachalinensis, Wilson.

P. Sargentii, Bean, "Trees and Shrubs Brit. Is.," vol. ii.

The unfolding leaves are of a glistening coppery-red. The young wood is greyish-brown, changing to a smooth, dark, chocolate-brown in the second year. The inflorescence is in one- to three-flowered umbels, the peduncle being either wanting or very short. The flowers are rose- or shell-pink, and in size vary from 3 to 3.75 cm. in diameter. With the approach of spring the buds become viscid.

The leaves are broadly ovate, and very noticeably rounder in shape than those of *P. mutabilis*.

With me the flowering period is fairly early, following that of *P. subhirtella*.

This is a very fine Cherry, and when its delicate rose-pink flowers are intermingled with the vivid copper-red of its young foliage, it presents a strikingly beautiful appearance, and, in my opinion, is undoubtedly one of the best of its family. It is almost equally attractive in the autumn, when its leaves change to various hues of orange and crimson before falling. I am entirely in accord with WILSON when he says, "if one kind only can be planted, it should be this."

In suitable soil, it is of comparatively rapid growth, and will ultimately attain a height, according to MIYOSHI, of about 60 or 70 feet. It should be noted, however, that the large trees at Koganei, near

Tokyo, referred to by WILSON, are apparently not of this species, but are forms of MIYOSHI's *P. mutabilis*.

I have several specimens growing here on their own roots. These were apparently raised from seeds obtained from the Arnold Arboretum, and are, therefore, probably descendants of plants originally introduced into America by Professor SARGENT from Sapporo in 1892. I have also a number of plants growing on the roots of *P. Avium*, and these appear to be perfectly happy on this stock. As the size of the flowers naturally varies in seedlings, it is only by grafting that one can be sure of securing the best strains.

WILSON suggests that *P. sachalinensis* is the parent of some of the finest garden varieties, such as Kanzan, Fugenzo, etc., but I think this statement is open to question. The distinctive appearance of the mature wood, the characteristic form of its rounder leaf, and the constant absence of an elongated peduncle are all against this assumption. Moreover, as MIYOSHI says, the cult of the flowering Cherry has been centred in the Kyoto district for hundreds of years, and, according to that writer, it is apparently only in recent times that this more northern tree has been available for horticultural selection.

In my collection I have a bushy form which I received a few years ago from Aldenham. It has not flowered with me yet, but in its smaller and greener immature leaves, and in its dwarfish habit, it certainly appears to be distinct.

2. SHIRO-YAMAZAKURA.

Prunus mutabilis, Miyoshi.

Syn. *P. serrulata* var. *spontanea*, Wilson.

Under this species MIYOSHI includes over sixty very variable forms, amongst which are Cherries which WILSON has associated with either *P. serrulata* or *P. Lannesiana*. The Wild Cherry of the mountains of south and central Japan (WILSON's *P. s. spontanea*) is, to my mind, obviously distinct from the form said to be spontaneous on the Island of Oshima, as well as from *P. sachalinensis*. The former WILSON calls *P. Lannesiana* var. *albida* and MIYOSHI *P. mutabilis speciosa*. In the present paper I propose to regard this plant, called by the Japanese Oshima Zakura, as a distinct species.

MIYOSHI's description, unfortunately, leaves one in doubt as to which form is the actual type of his *P. mutabilis*. I have one or two seedlings in my collection which, by their characteristic foliage, undoubtedly belong to a species distinct from either *P. sachalinensis* or *P. speciosa*, and it is upon the evidence of these plants that I feel satisfied as to the validity of MIYOSHI's new species.

These seedlings have not yet flowered with me, but the narrow form of their somewhat sparsely veined, smallish leaves (which are reddish in their young state), and their lax, almost drooping growth, appear to be very distinct. Their winter buds are also of a rather peculiar shape, being long, thin, and sharply pointed.

According to WILSON the Cherry he found in Western Hupeh (plants of which were introduced into this country from seeds collected by him in 1900) is identical with the Japanese plant. This Hupeh Cherry * I have in my collection, and in flower and foliage it appears to agree well with MIYOSHI's *P. mutabilis* f. *stricta* (cf. *Journ. Coll. Sc. Tokyo*, vol. xxxiv., p. 64, fig. 22), but is markedly different from my imported Japanese seedlings.

This Hupeh plant is a very beautiful tree, resembling *P. sachalinensis* in the brilliant, translucent, copper-red colour of its young leaves, and the soft pink hue of its flowers. It differs, however, from SARGENT'S Cherry by its peduncled inflorescence, the lanceolate form of its leaves, and by the colour of its bark. It thrives on *P. Avium*, and, on account of its beauty and hardiness, can be strongly recommended. It also colours well in the autumn. The fruit is black, small, and nearly spherical in shape.

It is apparently forms of *P. mutabilis* that attain the greatest height among the Cherries, and examples planted in the eighteenth century are still flourishing in the famous Koganei avenue.

The flowering period of my so-called *P. m. stricta* overlaps that of *P. sachalinensis*, commencing only a few days later.

As the arts and crafts of China were formerly all the vogue in ancient Japan, this Cherry may possibly be an introduction into that country. It is now well known that many other garden plants were long ago introduced into Japan from her neighbouring continent.

3. OSHIMA-ZAKURA.

Prunus speciosa, Koidzumi.

Syn. *P. jamasakura speciosa*, Koidz. *Tokyo Bot. Mag.*, xxv.

P. mutabilis speciosa, Miyoshi.

P. Lannesiana f. *albida*, Wilson.

In this tree the young leaves are bright green, with sometimes a polished, bronzy sheen. When fully developed they are often of a rather broad ovate form, the double or single serrations having short aristate teeth. It is a tree of vigorous habit and rapid growth. The young branches are stout, somewhat rigid, and usually of a mottled greyish-brown colour with rather prominent lenticels.

The flowers are normally pure white, and are borne in loose, more or less long-stalked corymbs. These measure from 3 to 4 cm. in diameter, and are faintly fragrant.

There can be little doubt that this Cherry is the parent of many of the ornamental varieties; in fact, Jonioi, Washi-no-o, and several others are obviously only slightly improved forms.

The typical Oshima Cherry is still rare in Western gardens, preference being rightly given to the more showy sorts.

* A tree raised, apparently from the same batch of seeds, was grown at Kew for some years under WILSON's original number 349. It very closely resembles my plant.

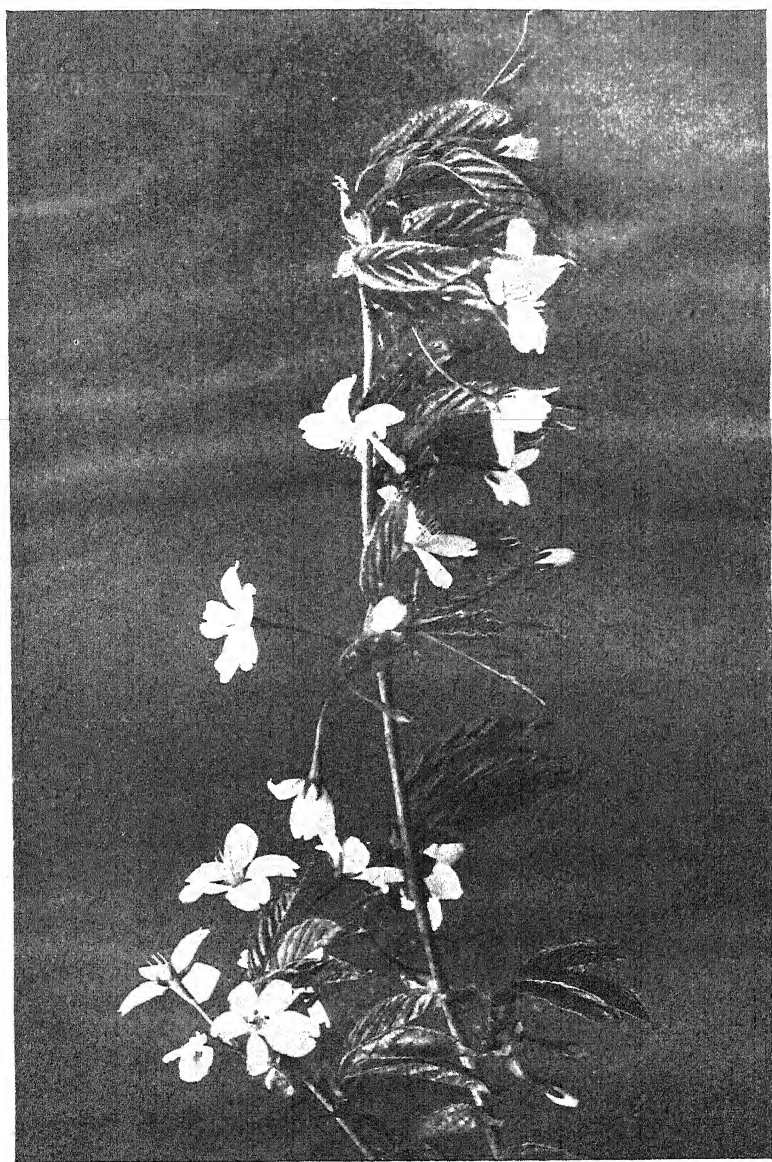


FIG. 46.—*PRUNUS MUTABILIS STRICTA*.



FIG. 47.—*PRUNUS SERRULATA KOJIMA*.

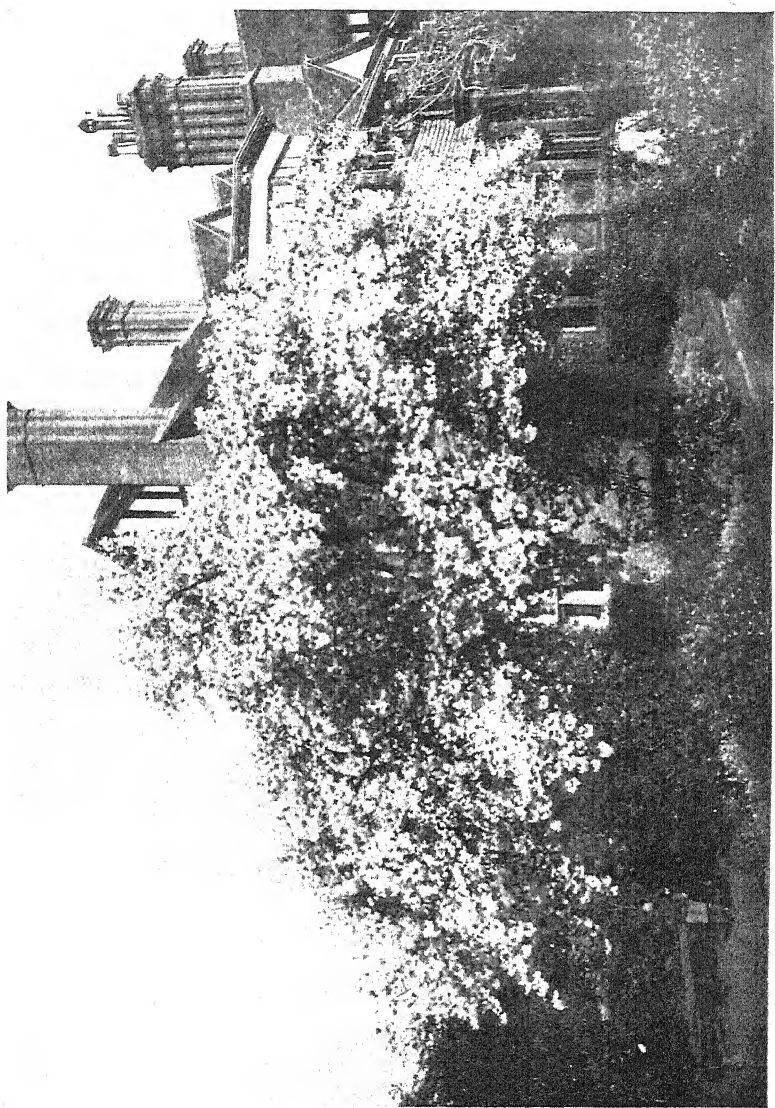


FIG. 48.—*PRUNUS SERRULATA* HOKUSAI.

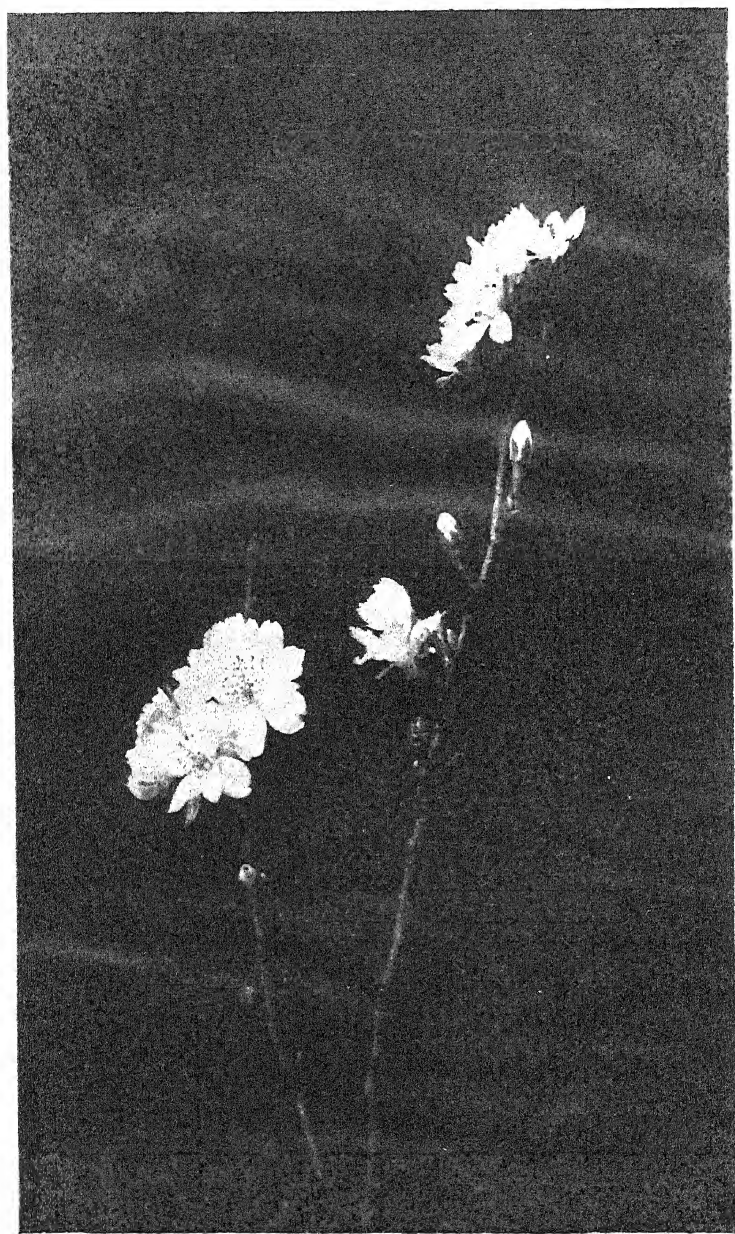


FIG. 49.—*PRUNUS SUBHIRTELLA AUTUMNALIS*.
(Photographed Dec. 1, 1924.)

I have a number of imported seedlings from Japan and, under genial conditions, these young plants make from 3 feet to 4 feet growth in the year.

MIYOSHI describes it as a large tree, but as it is a native of the warmer parts of Japan it will probably never attain the same stature in this country.

Its flowering period is mid-season.

4. ORIENTAL CHERRY.

Prunus serrulata, Lindley.

This double-flowered Cherry is almost certainly of Chinese origin, for it does not appear to be grown in Japan. WILSON, during his researches in the latter country, did not meet with this tree, and it is not figured as a native plant in either of MIYOSHI's works relating to Japanese Cherries. It is now taken as the type of the cultivated Oriental Cherries, as it was the first of these highly ornamental trees to be introduced into England in 1830. Whether it is of the same parentage as some of the Japanese forms bearing its name, is, I think, open to doubt.

The typical *Prunus serrulata* is inclined to be a widely spreading tree, its rigid branches sometimes growing almost horizontally. At Kew there is an old specimen which, according to BEAN, is only 10 feet high, and as much as 30 feet across.

The flowers open towards the end of April, or in early May. They are distinctly double, white, and not very large, measuring only about 3.5 cm. in diameter. The smooth and rather polished appearance of the mature ovate leaves, with relatively small, short-toothed serrations, are characters by which this tree may usually be distinguished.

Judging by the plant in my collection, this Cherry thrives well on the roots of *P. Avium*.

5. KANZAN.

Prunus serrulata sekiyama, Koidzumi.

Syn. *P. s. f. purpurascens*, Miyoshi.

P. s. var. sachalinensis f. sekiyama, Wilson.

'Hisakura' of nurserymen.

I have specimens of this tree imported from Japan, which agree perfectly with MIYOSHI's figure and description of this beautiful Cherry. The plants named by WILSON at Kew, Hisakura, Ohnanden, and Horinji, all appear to be identical with my Kanzan, and indeed I can detect no constant difference in any of these Kew specimens. Hisakura is a very distinct variety, as I have received it from Japan, and this name has certainly been misapplied in England. MIYOSHI's Horinji is also quite distinct, and cannot be confused with Kanzan. Ohnanden is a name used only by KOIDZUMI and WILSON, but the descriptions given by these writers are much too brief to be of the slightest use for

identification. The so-called 'Ohnanden' at Kew seems to open its flowers a day or two later than its neighbouring plants named 'Hisakura,'* and I have always fancied that its colouring in leaf and flower is slightly superior, but these differences are really almost inappreciable, and might easily be attributable to individual variation due to external influences. I am growing all these supposed forms at Benenden under similar conditions, but the majority of my plants are still too young for satisfactory comparison.

Kanzan is certainly one of the very best forms. It is perfectly hardy, of rapid growth, and easy propagation, uniting very freely with *P. Avium*. Having its young foliage of a bright coppery-red colour, and its large double blossoms rich rosy-pink, in the spring it combines beauty of both leaf and flower.

The boughs are more or less ascending, and, unless tipped in the autumn, are disinclined to branch. As with all the larger Japanese Cherries, the knife should be used as little as possible, but in order to make a well-furnished tree, it is often desirable to cut back in early life the extreme tips of the leading branches. Even so, they often "run away" again in long, single "leaders."

The leaves are comparatively large, smooth, and with relatively short-toothed serrations; the under-surface becomes whitish or glaucescent with maturity. The flowers are of a deep purplish-pink hue, much brighter and darker red in the bud. Leafy carpels are often present in the centre of the flower.

MIYOSHI says there is a "subform" of Kanzan, which he calls *pallida* with paler pink blossom. He gives it the Japanese name of Masuyame.

6. KIRIN.

Prunus serrulata kirin, Koidzumi.

Syn. *P. serrulata* f. *atrorubra*, Miyoshi.

P. serrulata var. *sachalinensis* f. *kirin*, Wilson.

This Cherry is very near Kanzan. It is, however, a little earlier in opening its flowers, which are borne on shorter-stemmed, and therefore more compact, corymbs. As MIYOSHI has pointed out, the reflexed involucreal scales at the base of the peduncle are rather large, and of a conspicuous reddish hue. Moreover, it apparently makes a smaller and broader crowned tree than Kanzan. This is noticeable in the Kew specimens.

It is a very beautiful form, quite as fine, in both flower and foliage, as the preceding variety.

WILSON erroneously describes this as a late-flowering form: it would be more apt to say in this respect that it is a mid-season variety.

* In his paper on Oriental Cherries, which appeared in *Country Life* (April 14, 1923), WILSON omits Hisakura from his lists of the best varieties. He probably, therefore, realizes the name has been used in error.

7. FUGENZO.

Prunus serrulata fugenzo, Makino.Syn. *P. s. var. Veitchiana*, Bean, "Trees and Shrubs Brit. Is." vol. ii., p. 252.*P. s. f. classica*, Miyoshi.*P. s. sachalinensis f. fugenzo*, Wilson.

This is a well-known and an old favourite in English gardens, being of comparatively early introduction. It is not of quite such vigorous habit as either Hokusai (commonly known as 'roseo-pleno' by nurserymen) or Kanzan (often incorrectly called Hisakura), but it will make a very fair-sized tree under favourable conditions. It is a singularly attractive form, with large, rose-pink flowers. These open rather late in the season, normally about the beginning of May, and are then often half hidden by the young coppery foliage. In this variety, the leafy carpels are nearly always a conspicuous feature of the flower, but this character is by no means confined to Fugenzo and to WILSON'S so-called *albo-rosea*, as that writer would have us believe. I have frequently seen this in other varieties, although perhaps not so constantly as in these two forms, and in Oku-Miyaku. The inflorescence is in fairly long-stalked, drooping corymbs of from two to four flowers, which are double, and of a rosy-pink hue. With the approach of spring, the winter buds lengthen and become sharply pointed, and their shape is then fairly characteristic of the variety. The aristate teeth, deeply scalloped serrations, lacinated stipules, and intercrossing branches distinguish Fugenzo at a glance from the also pink-flowered Kanzan.

I have this growing on both *P. Avium* and *P. mutabilis* stock, and it appears to thrive on either.

According to MIYOSHI, there is a subform called Kofugen, with deeper coloured flowers. I have not been able to recognize two varieties in England.

8. YAE-MURASAKI-ZAKURA.

Prunus serrulata purpurea (subf. *plena*), Miyoshi.

As growing in a friend's garden this is a small-sized tree. Indeed, the four imported specimens that were planted there about twenty years ago are still scarcely more than eight or nine feet high. This may, of course, be due to the dwarfing influence of the Japanese stock, for my own young plants grafted on *P. Avium* are making fairly vigorous growth. In the colour, shape, and smoothness of its mature foliage, this Cherry shows a marked resemblance to Kanzan, but the young leaves are, perhaps, not quite so bright, and the purplish-pink flowers are only semi-double (usually with about eight petals), and towards the end of the season they are often nearly single.* According to

* I have seen it in fruit. This tendency to revert to single flowers towards the end of the season is by no means peculiar to this form.

MIYOSHI, the type of *P. s. purpurea* is an entirely single variety, and I believe the plants I imported from Japan as 'Hisakura' will prove to be this form.

When in full flower—which is a little before mid-season—this Cherry, with its masses of brightly coloured blossom, is remarkably effective.

The winter buds, before opening in the spring, are vivid red, and are then very effective.

The literal translation of the Japanese name is Double Purple Cherry.

9. SHUJAKU.

Prunus serrulata shujaku, Koidzumi.

Syn. *P. serrulata f. campanuloides*, Miyoshi.

P. serrulata var. sachalinensis f. shuyaku, Wilson.

This Cherry is not unlike *P. s. versicolor* in its somewhat lank habit of growth and inflorescence. The individual flowers, however, are rather smaller and are generally more numerous in the lax corymbs. The pink semi-double or double flowers are borne in great profusion a little after mid-season. They are slightly campanulate in form, and measure about 4 cm. in diameter.

According to MIYOSHI, it does not make a big tree, and this statement agrees with my observations of some that were imported into this country about twenty years ago, and which are still of comparatively small size.

The unfolding leaves are yellowish-bronze; the single or double serrations are fairly small with short, aristate teeth. The leaf-glands are often solitary, or wanting altogether. Stipules and bracteoles small.

10. YAE-AKEBONO.

Prunus serrulata versicolor, Miyoshi.

Syn. *P. Lannesiana f. yae-akebono*, Wilson.

This is a very fine form with large, semi-double rosy-pink flowers, measuring nearly 5 cm. in diameter. There is a tendency for the colour to be more intense towards the edge of the petals—hence, apparently, MIYOSHI's varietal name.

I have based the identification of my plant on MIYOSHI's description, rather than on its resemblance to his figure of Yae-akebono. Indeed, the flowers are more like his representation of Horinji ("Die Japanischen Bergkirschen," pl. xv., fig. 60), but the description of that Cherry does not agree with my plant, and I have, therefore, decided to name it as above. The unfolding leaves are bronzy-green.

Considering its beauty, it is surprising that this Cherry is so very rare in English gardens. A possible explanation may be in its apparent disinclination to amalgamate with *P. Avium*; it is true I have only tried a few grafts, but these certainly did not unite as freely as I would have liked.

II. DAIKOKU.

Prunus serrulata daikoku, Ingram nom. nov.

Growing in a friend's garden I have found a very interesting collection of Japanese Cherries that were apparently imported from Japan about twenty years ago. Amongst these there is a single plant of a form that appears to be strikingly distinct from anything figured or described in MIYOSHI's work; nor can I find a description to fit it in WILSON's "Cherries of Japan." I have no alternative, therefore, but to give it a new name.

The flowers are very large, measuring up to 5.5 cm. in diameter. They are fully double, having 40 or more petals of a purplish-pink hue, and in the centre of each is a cluster of small leafy carpels. The buds are dark, purplish-red, very thick, and with a broad truncated end. The inflorescence is in the form of a loose, drooping corymb, the peduncle being thick and very long.

The unfolding leaves are yellowish-green, and the serrations have only small aristate teeth. Branchlets dark brown.

MIYOSHI's figure depicting his *P. serrulata f. multipetala* (pl. xix. "Die Jap. Bergk.") is suggestive of this Cherry, but the flowers are altogether too small, nor are they of the same flattened form.

I now have young plants from my friend's tree grafted on *P. Avium*. Daikoku is the name of the Japanese God of Prosperity.

12. HOKUSAI.

Prunus serrulata hokusai, Ingram nom. nov.

Syn. (?) *P. Lannesiana f. Ojochin*, Wilson.

It is certainly strange that there should still be doubt as to the correct identification of one of the commonest and most beautiful of Japanese Cherries. Yet this is the case with the plant commonly sold by nurserymen as *Cerasus roseo-pleno*—a plant familiar to almost every lover of beautiful trees. The explanation probably lies in the fact that there are several very closely related forms, the names of which have apparently now become inextricably confused. In their perplexity European growers have resorted to a name of their own, unfortunately a *nomen nudum*. Wishing finally and, if possible, definitely to settle this question, last spring I sent to Prof. MIYOSHI of Tokyo two of these forms,* but he was unable to identify either of them, and suggested they were without names. "Although there are a great many garden forms of Cherries in Japan," he wrote, "comparatively few have correct names, i.e. classical names mentioned in literature." I have no alternative, therefore, but to bestow upon this well-known Cherry a new varietal name, and, in doing so, have decided to call it after the world-famous Japanese artist HOKUSAI.

* One of these was taken from the Kew tree named by WILSON *Ojochin*, but MIYOSHI gives good reason for saying it is not this variety.

This Cherry has been propagated in Europe for at least half a century, and in my opinion is one of the hardiest and best forms in general cultivation, and, given a suitable site, will make a really fine tree. I have in my garden an isolated specimen that is possibly the largest in England, as it now (1924) measures approximately 37 feet through its broadest diameter and is upwards of 22 feet in height. This tree was probably only a few years old when planted in or about 1893. I have no doubt that its dimensions would have been still greater had it been placed in a more sheltered position. Even in Japan trees of the double-flowered varieties do not frequently exceed these dimensions: I think, therefore, that this specimen is fairly conclusive evidence in support of my contention that *Prunus Avium* is an entirely suitable stock for these Cherries in our English climate. When every branch is smothered in spring with delicate pink blossom no tree could be more beautiful than this.

The young leaves are brownish-bronze and the twigs pale greyish-brown, often lenticelled and blotched with grey. The light pink flowers are large and semi-double, usually having 7 to 12 petals and measuring about 4.75 to 5 cm. in diameter. They are borne in more or less loose corymbs, opening towards the end of April.

There are, as already stated, several other semi-double pink or pinkish flowered varieties very difficult to determine. The Cherry Yedo (*Prunus serrulata nobilis* of MIYOSHI) is closely related but has, according to that authority, richer pink flowers, short inflorescence, and about 15 petals.

13. SENRIKO.

Prunus serrulata senriko Koidzumi.

Syn. *P. serrulata* f. *picta*, Miyoshi. p. 130.

P. Lannesiana f. *senriko*, Wilson. p. 50.

This variety came into my possession by the merest chance. A casual acquaintance sent me a parcel of bud-wood, which he had cut haphazard from some fancy Cherries that were growing in his small suburban garden. Having no stock available at the time, I was obliged to work these buds on to some wild Gean growing in a small spinney that I was then renting for shooting purposes. Soon after the farm was sold, and in the end I had to remove my budded plants by secretly trespassing on my neighbour's property!

These plants turned out to be Senriko—a variety I was then most anxious to add to my collection.

The rounded petals give the flowers of this Cherry substance and form: they are pink in the bud, but fade to pinkish white or white as they open. They are almost always single and fairly large, measuring up to 4.5 cm. in diameter.

This variety, a very attractive and beautiful form, is characterized by its sturdy growth and rather rigid habit. The winter buds are very plump and noticeably more ovoid than in most varieties. The

flower buds are almost round. The young leaves are bronzy-brown, becoming with age rather tough and leathery in texture.

This Cherry was exhibited at Vincent Square in May 1924. It was unfortunately misnamed 'Ojochin,' and as such received an Award of Merit.

14. ORIENTAL WEEPING CHERRY.

Prunus serrulata rosea, Wilson.

(Often sold as Cheal's Weeping, Lidera Nova, or Shidare-sakura by nurserymen.)

The origin of this beautiful variety seems wrapped in mystery. I can find no evidence of its ever having been cultivated in Japan. Neither WILSON nor I met with it in that country. Indeed, if it were growing there now, it is altogether beyond the bounds of possibility that so striking a form should have entirely escaped the notice of the two Japanese botanists, KOIDZUMI and MIYOSHI.

It seems, therefore, highly probable that it is a Chinese variety, and there is reason to suppose that it reached English and American gardens via Germany. In the rather lanceolate shape of its leaves and general size of its flowers it at first suggests affinity to the Hupeh Cherry (which I have tentatively named *Prunus mutabilis*, cf. p. 75), but on closer comparison it will be found that its leaves are more coarsely serrate (often biserrate) and that they lack the dull whitish or glaucescent under-surface. In the Hupeh Cherry the serrations are simple, small, and almost toothless.

In the Oriental Weeping Cherry (which must not be confused with the very distinct Weeping Spring Cherry *P. subhirtella pendula*), the deep pink-coloured flowers are borne in rather close fascicles along the steeply pendent boughs.

Seen at its best, it is a really lovely Cherry, notwithstanding its inclination to be rather sparing with its long, drooping, and often poorly furnished branches. The flowers are densely double, and are very freely produced.

15. TEMARI.

Prunus serrulata temari, Koidzumi.

Syn. *P. Lannesiana f. temari*, Wilson.

WILSON has identified a beautiful and very floriferous variety now growing at Kew as belonging to this form. It bears close clusters of pale pink blossom, which literally smother the steeply ascending, semi-erect boughs with masses of apple-like flowers. These are mostly, though not invariably, single, and are individually quite large, measuring up to 5.25 cm. in diameter. The compact, short-stalked form of the corymb appears to be characteristic of this variety.

The figure and description of MIYOSHI's Benitora-no-o (*P. s. formosissima*, Miyoshi, cf. p. 117, fig. 65) are nearly appropriate to this

variety, and it may prove to belong here. MIYOSHI, however, does not give KOIDZUMI's name as a synonym, nor does he include 'Temari' in either of his works.

Thanks to the Director's generosity I possess young plants derived from the Kew specimen.

16. OSHOKUN.

Prunus serrulata conspicua, Miyoshi.

MIYOSHI describes, but does not figure, this variety. The plants I have imported from Japan under this name agree fairly well with his description. On its native stock, it appears to be of feeble habit, seemingly exhausting its vigour by a superabundance of flowers. In the bud stage these are bright red, almost carmine, but they fade to pink when fully open. These are of medium size, and are borne in multiple and rather short-stalked clusters, usually towards the ends of the branches. The one-year-old wood is dark brown.

I am trying this variety on the roots of *P. Avium* in the hopes of obtaining thereby more vigorous plants.

The leaves are of a rather smooth, silky texture, and are bronze- or brownish-green in colour when young.

Flowering period a little after mid-season.

17. AMA-NO-GAWA.

Prunus serrulata erecta, Miyoshi.

Syn. *P. Lannesiana f. amanogawa*, Wilson.

Its remarkable fastigiate growth is a very distinctive character of this Cherry; even the inflorescence is in the form of erect, clustered corymbs. Although somewhat stiff and "leggy" in appearance, this is a really beautiful variety when in flower, for the corymbs form large and dense bouquets of bloom grouped round the branch ends. The flowers are pale pink, fragrant, and of moderate size, normally single, but sometimes semi-double.

The young leaves are yellowish-bronze, and of a soft, silky texture. The double or single serrations are furnished with short aristate teeth.

The flowering period is a little past mid-season.

The literal translation of its vernacular name is 'Celestial River,' which is apparently the Japanese equivalent for our 'Milky Way.'

MIYOSHI mentions a subform with white blossoms, which he has named *albida*—or Tanabata in Japanese. This form is unknown to me.

18. SHIROFUGEN.

Prunus serrulata albo-rosea, Wilson.

Syn. *P. s. var. sachalinensis f. albo-rosea*, Wilson.

Under the above names WILSON describes "a beautiful cherry with flowers pink in the bud, changing to white as they open, and distinguished by two green leafy carpels in the centre of the flower."

This description would apply equally well to two very distinct forms—one with greenish unfolding leaves which I have received from Japan as 'Oku-Miyako,' and another with reddish-bronze unfolding leaves which has come to me from the same source as 'Shirofugen.' As WILSON has associated his plant with *sachalinensis*, I am assuming that it is the reddish-leaved variety he refers to, and not my so-called 'Oku-Miyako,' which, in the colour of its twigs, young leaves, and the longer aristate points to the serrations, clearly indicates affinity to the group he calls *Lannesiana*. True, WILSON has named the 'Oku-Miyako' plants at Kew 'Shirofugen,' but he did so from dry material by which, as he admits himself, it is wellnigh impossible to name these horticultural varieties with any kind of certainty. MIYOSHI does not include Shirofugen in his monographs, nor can I find a plate or description to fit the plant under discussion.

This Cherry is one of the latest to flower. The flowers appear when the foliage is well advanced, and, as is then almost always the case with Japanese Cherries, the corymbs are long-stalked, loose, and drooping. Although pink in the bud, the large and distinctly double flowers become pure white with maturity, passing again to pinkish before the petals fall. They sometimes measure as much as 5.25 cm. in diameter. In the first leaves, the attenuated point normally found in the foliage of these Cherries is very frequently wanting, and this gives the leaves a rounded and rather characteristic appearance.*

Shirofugen is a robust tree of rapid growth, and has wide-spreading branches, with darkish-brown bark.

Bracteoles are rather small.

Shirofugen signifies the 'White God' in Japanese.

19. OKU-MIYAKO.

Prunus serrulata longipes, Miyoshi.

Syn. *P. Lannesiana f. miyako*, Wilson.

MIYOSHI describes this form as having light pink flowers. In the plants I have imported under this name, and in all those I have seen elsewhere, they are pure white when fully expanded, and not pink; otherwise MIYOSHI's description applies in almost every respect.

As already stated, WILSON has named the Kew specimens of this Cherry Shirofugen, but I have no doubt that this was in error due, possibly, to his not having examined the living plants in flower.

MIYOSHI's varietal name is well chosen, since the three- to six-flowered, drooping corymbs are remarkably long-stemmed, the total length of the inflorescence sometimes measuring as much as 14 or 15 cm. and even more. With Shirofugen it is one of the latest to open its flowers.† These are double and large, usually measuring

* Similar leaf formation may be sometimes seen in other varieties, but not so constantly.

† In 1924, a notoriously late season, both these Cherries were still in bloom with me on June 1.

about 5 cm. in diameter. The distinctly frayed margin of the petals, pale brownish-grey branches, and long aristate teeth on the leaves, immediately distinguish this Cherry from Shirofugen, which is also a late, double-flowered, white variety. It unites very readily with *P. Avium* and makes a fair-sized tree.

I know of trees now growing in a friend's garden that were imported twenty years ago. Considering its beauty, it is very surprising that this form is not better known.

20. KOJIMA.

Prunus serrulata kojima, Ingram nom. nov. (fig. 47).

This Cherry may, I think, prove to be identical with MIYOSHI'S *P. serrulata hosokawa-odora*. That writer's description agrees fairly well, but the figure does not indicate the characteristic and somewhat campanulate form of the flower; moreover, the plants I imported from Japan under this name were very distinct. Being undecided as to its identity when I exhibited a flowering spray of this Cherry at Vincent Square on April 29, 1924, I thought it the wisest plan to bestow upon the plant a new name rather than run the risk of giving it one that was already occupied. It was much admired on that occasion, and was, I think, deservedly eulogized in the Press, for it is undoubtedly one of the very finest forms. The flowers, which hang in long, graceful corymbs among the green leaves, are of the purest, snowy whiteness. They are large, inclined to be campanulate, and are frequently semi-double, with an inner ring of petaloid stamens.

The leaves and bracts are furnished with exceptionally long aristate teeth, and the stipules are bearded and deeply lacinated.

My young plants are making rapid and vigorous growth. The colour of the unfolding leaves and of the wood, the fragrance of the flowers, and the general aspect of the tree, leave little doubt that it is a near descendant of *P. speciosa*.

The name Kojima is given in memory of the faithful warrior of legendary fame (see p. 75).

21. TAKINIOI.

Prunus serrulata cataracta, Miyoshi.

Syn. *P. Lannesiana f. takinioi*, Wilson.

Another name for this Cherry is Gazanoma-nioi, but I prefer to use the shorter and prettier appellation, which means, according to WILSON, the fragrance of a cataract. Apart from its name, this Cherry has little to commend it, unless it be the comparative lateness of its white and slightly fragrant flowers. Although they contrast pleasingly enough with the young, bronze-coloured foliage, the individual, usually single, flowers are not very large, nor are they of good form, having relatively narrow petals.

The unfolding leaves are reddish-bronze, lanceolate, and rather deeply crinkled by the veins. Even when mature they are much narrower in shape than in the majority of Japanese Cherries.

In Surugadai-nioi the leaves are also lanceolate, but in this variety they are duller and rather greener in the young stage.

Takinioi flowers towards the end of the season, and is one of the last to come into leaf.

22. SURUGADAI-NIOI.

Prunus serrulata surugadai-odora, Miyoshi.

Syn. *P. Lannesiana* f. *surugadai*, Wilson.

My imported plants do not agree entirely with MIYOSHI's figure of this Cherry, the petals being narrower and more widely separated in the fully expanded flower. It is a poor form, near to, and, if anything, inferior to the last. The young foliage is pale brownish- or bronze-green, instead of reddish-bronze, as in Takinioi.

The narrow, widely-spaced petals give the flowers a rather ragged and mean appearance. These open towards the end of the season.

23. JONIOI.

Prunus serrulata affinis, Miyoshi.

Syn. *P. Lannesiana* f. *jonioi*, Wilson.

Although the individual flowers are not large, they are borne in such abundance, and are so delightfully fragrant, that this Cherry is quite one of the most charming of the single white forms. It also has the advantage of being a quick grower, and, branching freely, makes a shapely and well-furnished tree.

The unfolding leaves are pale golden-brown, and the twigs are light brownish-grey. The inflorescence is in long-stalked three- to five-flowered corymbs. The flower measures about 3.5 to 4 cm. in diameter.

Jonioi (which means "supreme fragrance," the affix "nioi" always denoting a fragrant variety) was introduced to England a number of years ago, but is still very rarely met with in our gardens. There is a tree at Kew at least 15 or 16 years old.

24. BOTAN-ZAKURA.

Prunus serrulata moutan, Miyoshi.

Syn. *P. Lannesiana* f. *botan-zakura*, Wilson.

I have imported plants of this Cherry from Japan, and have received grafts of it through the kindness of my American friends. The former flowered with me this spring. In these young plants the flowers are very large, and nearly single, having usually not more than one or two extra petals. Pink in the bud, they fade to

pinkish-white or white when fully expanded. The inflorescence is in two- to four-flowered, rather flattish corymbs. Individual blooms will sometimes measure well over 5 cm. in diameter. The sepals are distinctly serrated. Although this last character is not peculiar to Botan-zakura (it is also noticed, for instance, in Ariake), it seems to be most pronounced in this variety.

The young foliage is bronze coloured: very coarse leaf serrations terminate in fairly long aristate teeth. The twigs are mottled, and greyish-brown to brown in colour.

Flowering period is towards the end of April; that is to say, it may be regarded as a mid-season variety.

"Botan" is the Japanese for a pæony, and this Cherry has no doubt acquired this name on account of the supposed resemblance of its flowers to those of the tree pæony.

MIYOSHI's figure shows a rather more "double" flower than those of my plants, nor does it depict the serrations on the sepals; in other respects, however, it agrees, as also does his description.

25. ARIAKE.

Prunus serrulata ariake, Koidzumi.

Syn. *P. donarium* subsp. *speciosa* var. *nobilis* f. *ariake*, Koidz. (1913).

P. serrulata f. *candida*, Miyoshi.

P. Lannesiana f. *ariake*, Wilson.

This form is another large-flowered Cherry with nearly single, pinkish-white, or white bloom—sometimes there is an additional petal or two in the centre of the flower, but in young trees, at any rate, they are mostly single. They measure up to 5.5 cm. in diameter. The petals being spaced towards the circumference of the flower give it a rather *Rubus*-like appearance.

In its foliage and the colour of its twigs Ariake is not unlike the preceding, but it always blooms several days earlier. If anything, Ariake seems to be of more vigorous habit than Botan-zakura, but both varieties are rather coarse growers and disinclined to multiply their branches, a fault which tends to produce a somewhat stiff and ungainly tree.

Both varieties, however, should be included in collections, if only on account of the remarkable size of their flowers.

The word Ariake means "dawn" in Japanese.

26. TORA-NO-O.

Prunus serrulata caudata, Miyoshi.

This is a pleasing, but not a very conspicuous variety, with single white flowers, sometimes very faintly ringed with pink. In contrast

with these, the cupula and sepals are rather dark reddish-brown. The individual flowers are small, measuring only about 3.75 cm. in diameter. They are borne from three to five together, in somewhat loose corymbs.

The unfolding leaves are yellowish-green, and the one-year-old twigs pale greyish-brown.

I discovered this Cherry in a friend's garden, where, after twenty years, it is still only a small tree.

The flowering period appears to be early mid-season.

The Japanese name signifies "Tiger's tail."

27. WASHI-NO-O.

Prunus serrulata wasinowo, Koidzumi.

Syn. *P. serrulata f. arguta*, Miyoshi.

P. Lannesiana f. wasinowo, Wilson.

This Cherry appears to be of remarkably vigorous habit, and should be grown, if only upon this score. My trees (on Japanese stock) are making rapid headway, and are outstripping all their fellows.

The flowers are white, fragrant, and generally single, although they sometimes have an extra petal or two. They are of good shape, but only of moderate size, usually measuring about 4 cm. in diameter. Compared with some of the other forms the peduncle is often rather short.

The unfolding leaves are brownish-bronze; the inner surface of involucre scales, orange.

The flowering period is mid-season.

This Cherry is still rare in English gardens.

The Japanese name signifies "Eagle's Tail."

28. RUIRAN.

Prunus serrulata ruiran, Ingram nom. nov.

Syn. (?) *P. s. communis*, Miyoshi.

(?) *P. s. spontanea f. Kosioyama*, Wilson.

I received a Cherry labelled Ruiran from Japan a few years ago. This I have been unable to identify satisfactorily with any of MIYOSHI'S varieties, nor is there a Cherry so named in either KOIDZUMI'S or in WILSON'S list.

The nearest description and figure to my plant that I can find in MIYOSHI'S "Die Jap. Bergk." appear to be those of *P. serrulata communis* (*Koshio-yama*), but as there are several slight discrepancies, I have deemed it advisable, in the meantime at any rate, to retain the Japanese nurseryman's name.

Although a pleasing plant when decked in bloom, Ruiran lacks the showiness of many of the cultivated forms, or the dainty charm of some of the species.

The flowers are inclined to be campanulate in form, and are rather small, measuring only about 3.5 cm. in diameter. They are pale pink in colour, fading to whitish when fully open. They are usually borne in four-flowered corymbs, with the peduncle longer than the pedicels.

The unfolding leaves are rather dull, brownish-green. They have simple serrations, with comparatively short aristate teeth, and with usually only about six or seven veins. Glands wanting or single. Bracts and stipules small. Bud scales bright vinous red, and very striking in the spring.

It is probably this vivid colouration of the vernal buds that causes it to be appreciated by the Japanese, who will often grow deciduous plants not solely for the beauty of their foliage or inflorescence as we do, but purely for their winter effect.

Flowering period early mid-season.

From herbarium material, WILSON named this Cherry as growing at Kew, *P. s. spontanea*. The fact that my imported plants have all been grafted is clear evidence, I think, that this is a garden variety, and not a wild form.

It is without question quite distinct from the Kew plant No. 349, also named by WILSON *P. s. spontanea* in his "Cherries of Japan" (p. 29).

I have succeeded in raising a variegated sport of Ruiran, the unfolding leaves of this plant being flesh pink.

Ruiran signifies egg, a name probably derived from the slightly ovate form of its blackish fruit.

29. UKON.

Prunus serrulata grandiflora, A. Wagner.*

Syn. *P. serrulata f. luteo-virens*, Miyoshi.

P. Lannesiana f. grandiflora, Wilson.

Of early introduction, this variety, with its rather peculiar yellowish-tinged flowers, is now well known and often met with in English gardens. Its boughs are somewhat straggling, and are inclined to be rather poorly furnished with foliage. Apart from this, it is a very beautiful Cherry, for it has decidedly large, semi-double flowers, which are borne in great profusion. These are white, suffused with pale greenish-yellow, and seen in contrast with the brown-bronze of the unfolding leaves are very effective. The mature foliage in vigorous young plants is often very large.

Ukon unites freely with *P. Avium*.

MIYOSHI mentions another form, called 'Asagi,' with flowers of a paler yellowish-green hue. This subform he designates *luteoides*.

* MIYOSHI calls the variety Mangetsu *P. s. grandiflora*, evidently in ignorance of WAGNER's name.

30. GIOIKO.

Prunus serrulata gioiko, Koidzumi.Syn. *P. serrulata f. tricolor*, Miyoshi.*P. Lannesiana f. gioiko*, Wilson.

Judging by my young plants Gioiko appears to be more interesting than beautiful. The flowers are creamy-white, with blurred greenish streaks, the tips of the petals being occasionally tinged or marked with pink. Hence, presumably, the reason of MIYOSHI's varietal name *tricolor*. With me a large proportion of the buds never develop normal petals and the aborted flower remains a mere cluster of green sepals.

Although this Cherry is not perhaps quite so vigorous as Ukon, it is nevertheless of good habit, and will, no doubt, grow into a fair-sized tree.

Its characteristic flowers, which are rather smaller than in Ukon, distinguish this Cherry from all other varieties, and no further description is therefore needed.

Flowering period mid-season.

31. SIEBOLD'S CHERRY, OR TAKASAGO.

Prunus serrulata Sieboldii, Wittmack.Syn. *P. serrulata f. caespitosa*, Miyoshi.*P. Sieboldii*, Wilson.

Often called Waterer's Cherry.

Whether this Cherry, with its soft, dense pubescence and broader-shaped cupula, should be given specific rank or not is a rather moot point. The fact that its flowers are double is clear evidence of its garden origin, and, indeed, no wild prototype appears to be known. WILSON separates it; MIYOSHI does not.

The pubescence of its leaves is not in itself sufficient reason to give it specific distinction, since this character is shared also, but to a lesser degree, by the forms called Taizanfukun, Hokizakura, and others. This being so I have, in the meantime, decided to follow MIYOSHI and keep SIEBOLD'S Cherry in association with the cultivated varieties of *P. serrulata*.

That writer, by the way, separates the Cherries Taizanfukun and Hokizakura under the name *Prunus fruticosa*.* I possess both these plants, but as they have not yet flowered with me I am unable to express any opinion on this point.

SIEBOLD'S Cherry only makes a small tree, but is very floriferous, and is remarkably showy when, about mid-April, it is smothered in pale pink blossom. These are semi-double and fairly large, measuring

* This name, in any case, cannot stand, since it is preoccupied, the small Ground Cherry of Siberia being so called by PALLAS.

about 4·5 cm. in diameter. Normally the peduncle is short, but when the flowers and foliage appear together it is longer. The young leaves vary from yellowish-brown to reddish-bronze; the sappy, immature branch stems are dark purplish-red in the early summer.

There appear to be several forms of SIEBOLD's Cherry in cultivation. WILSON enumerates three, including Yokihi, *P. serrulata mollis* of MIYOSHI. There must, however, be some mistake here, as MIYOSHI's Yokihi is placed amongst the glabrous varieties, and can, therefore, have nothing to do with *Sieboldii*. WILSON says that the Japanese vernacular for *P. s. Sieboldii* is Naden, but MIYOSHI applies this name to a totally different variety.

32. YOSHINO.

Prunus yedoensis, Matsumura.

In deference to general opinion, rather than from personal conviction, I have given this Cherry specific rank. There is every reason to suppose that it is of garden origin. WILSON suggests that it is a hybrid, and I am entirely in accordance with this view, the general appearance of the plant indicating *P. speciosa* and *P. subhirtella rosea* as probable parents. In the shape, colour, and texture of the leaves it shows affinity to the former; in the pubescence of its young shoots, and the pinkish tint of its flowers, it indicates relationship with the latter. Although I have not experimented myself, I understand Yoshino comes more or less true from seed—a circumstance, of course, that does not tend to support the hybrid theory.

Yoshino is a very floriferous and beautiful Cherry, and is immensely popular with the Japanese. It has been said that over 50,000 of these trees have been planted in and around Tokyo.

A full-sized tree covered with pale-pink bloom is a very lovely object, and an avenue of them seen at their best on a bright spring day beggars all description. It is no wonder, then, that the Japanese throng in their thousands to the public parks every year solely to gaze upon these Cherries—the marvel is that the tree is still almost unknown in our English gardens.

It is very easily propagated on *P. Avium* roots, and is quite hardy and of rapid growth, so there is no real reason, save that of ignorance, to explain its neglect in Europe.

Pale pinkish at their prime, before the petals fall, the centres of the flowers, including the filaments, become stained with purplish-pink, and then acquire an added charm. The unfolding leaves are yellowish-green, and the glands remain this colour. At first sparsely pubescent, the shoots and leaves become glabrous when mature. The pedicel and calyx are usually clothed with minute hairs. Bark pale greyish. The flowers open early in the season.

THE SPRING CHERRIES.

The spring Cherries form a charming group of diminutive trees, quite as attractive in their own way as the larger flowered 'Serrulata' Cherries. In the early spring the cultivated varieties are lavish with their bloom, and are then extremely ornamental, and a valuable asset to any garden.

MIYOSHI, in his monograph of the Japanese Cherries, figures five forms of Higan-sakura,* besides the autumn-flowering *P. subhirtella autumnalis*, which he considers specifically distinct. As I can see no reason for separating the latter plant, I have decided to follow WILSON and keep them all together under MIQUEL's original name.

I have at least five quite distinct forms growing at Benenden. Some of these are own-rooted plants, but several have been worked on *P. Avium*, and these appear to be quite healthy, despite WILSON's condemnation of this stock.

33. BENI-HIGAN.

Prunus subhirtella rosea, Ingram n. comb.

Syn. *P. subhirtella*, Wilson.

P. aequinoctialis rosea, Miyoshi, "Japanese Cherries."

This is the form that has been cultivated at Kew for some years under the name of *P. subhirtella*. The flowers are pale pink, of better shape, and rather larger than those of the following varieties. They are borne in great profusion, sometimes opening as early as the end of March.

The prefix Beni means pink, or pinkish.

34. USU BENI-HIGAN.

Prunus subhirtella albo-rubescens, Ingram n. comb.

Syn. *P. aequinoctialis albo-rubescens*, Miyoshi, "Japanese Cherries."

I have a single specimen of this variety planted in a rather exposed, wind-swept position. Here it is inclined to be of bushy habit, and is continually throwing up strong branches from near the ground level. It differs from *P. s. rosea* by having larger and darker-coloured foliage, smaller white flowers, and by being several days earlier. It is amazingly floriferous, almost every leafless twig being smothered in March with clusters of small white blossom, the beauty of which is greatly enhanced by the vinous-red cupula and sepals.

The prefix Usu means pale.

* The literal translation of Higan-sakura is, I believe, 'Equinox Cherry.' They are apparently so-called on account of the flowering period being round about the vernal equinox.

35. SHIRO-HIGAN.

Prunus subhirtella ascendens, Wilson.Syn. *P. aequinoctialis*, Miyoshi, "Japanese Cherries."

My young imported trees have not yet flowered. This variety would appear to be of little horticultural interest, although in its native country it grows into a fine tree. With me it does not seem so contented as the two previous forms, and I am wondering if it will prove as hardy.

This is probably the prototype of the cultivated varieties. It has probably been imported before, but I do not know of any other specimens.

36. WEEPING ROSEBUD CHERRY, OR SHIRO-SHIDARE.

Prunus subhirtella pendula, Tanaka.Syn. *P. aequinoctialis pendula*, Miyoshi, "Japanese Cherries."

In its best form the pronounced pendulous habit and elongated willow-like leaves give this Cherry a very distinct appearance. It will sometimes come true from seed, but intermediate forms appear with every sowing. The best variety bears abundant bloom in long, loose corymbs, the individual flower being rather small and of a rosy-pink hue—almost carmine in the bud. In Japan old trees have been recorded up to 48 feet (WILSON), but in this country growth is never likely to be strong enough to raise its head so high. Another Japanese name for it is Ito-zakura, or Thread Cherry.

37. JUGATSU-ZAKURA.

Prunus subhirtella autumnalis, Makino.

This is a remarkable and interesting form, which opens its first crop of flowers in mid-winter at Benenden, usually towards the end of December. These are borne, of course, on the bare branches, and the pedicels are then much abbreviated; with the second or spring crop of flowers which appears with the foliage, the pedicels are very much longer. This is the only form of the group that has semi-double flowers, which are of a pleasing pinkish-white colour.

According to BEAN, it was first introduced by an Irish nurseryman in 1911, as *P. Miqueliana*, and it is sometimes still offered under this name. It has, however, been grown in England longer than this, and there is a magnificent specimen at Borde Hill planted about 1906. This is the finest example I have seen, being about 21 feet high, with low spreading branches 36 feet or 37 feet through.

Jugatsu-zakura means October Cherry. Apparently it flowers in Japan during this month.

*List of Other Varieties growing under Name (but not yet determined)
at Benenden.*

Prunus serrulata Amayadori.	P. s. Miyako.
P. s. Benitora-no-o.	P. s. Miyako-beni.
P. s. Daizan.	P. s. mollis.
P. s. Fudzakura.	P. s. nobilis.
P. s. grandiflora (nec. Ukon).	P. s. Ohoibayama.
P. s. Hakizakura.	P. s. Okihu-zakura.
P. s. Harazakura.	P. s. praecox.
P. s. Hatazakura.	P. s. Ruriran.
P. s. Hokizakura.	P. s. Shogetsu.
P. s. Hosokawa-odora.	P. s. Sirotae.
P. s. Kabazakura.	P. s. Sumizone.
P. s. Kabuto-zakura.	P. s. Taizanfukun.
P. s. Kariginu.	P. s. Udzu-zakura.
P. s. Kivigava.	P. s. Zenkoji.
P. s. Komatsumagi-zakura.	

N.B.—The author would be very glad to hear of any varieties of Japanese Cherries now growing in England that have not been mentioned in the above list or described in the body of this paper.—C. INGRAM, The Grange, Benenden, Kent.

THE AWARD OF GARDEN MERIT.—V.*

29. PIERIS JAPONICA.

Award of Garden Merit, March 24, 1924.

BETTER known probably as *Andromeda japonica*, this Japanese shrub is one for gardens where Rhododendrons flourish (for it will not tolerate lime), and where shelter can be given it (for it flowers in February and March, when frosts are apt to brown the flowers, and starts into growth immediately after, when late frosts are apt to kill). In spite of these drawbacks it is a plant worth taking trouble over, for when well grown and in full flower it is magnificent. The buds develop in early autumn, but the pendent clusters of white flowers are not at their best until early spring, when they are set off by the narrow shining green leaves. Then, all being well, the flowers past, a second period of beauty follows, for the young leaves are bronze and contrast well with the deep green foliage. There are a good many plants of it at Wisley, and its seedlings occasionally come up in the wood, as well as do those of its rather hardier but less beautiful relative, *P. floribunda*. The largest of these plants is nearly 10 feet in height and as much through, and is frequently completely covered with flowers. The Formosan species *P. taiwanensis* seems to be hardy at Wisley and bids fair to be a very fine plant. *P. formosa*, the most magnificent of the genus, has not made a large plant, nor has it flowered well at Wisley. The deciduous species *P. Mariana* grows well there.

30. RHODODENDRON AUGUSTINII.

Award of Garden Merit, May 19, 1924.

It is often unsafe to recommend a plant by its botanical name alone, and this is perhaps especially true of Rhododendrons, and particularly of *Rhododendron Augustinii*. It is described as being very variable in the colour of its flowers, which may be white, pink, purplish-pink, or bluish, and some writers go on to say "some are among the most pleasing in the genus." This infers that some are far less pleasing, and this is true; in fact some forms are not worth growing, and it is wise to see the plants in flower before they are purchased. The award is given because the plants are sometimes so beautiful, and this is especially true of the bluest ones. So long as it is planted in soil that suits Rhododendrons it will make good growth, forming bushes up to 8 or 10 feet tall, with leaves $1\frac{1}{2}$ to 4 inches long and $\frac{1}{2}$ to 1 inch

* For earlier annotated lists of Awards of Garden Merit see vol. 47, p. 189; 48, pp. 58 and 223; and 49, p. 233.

wide, ending in a fine point, minutely downy above and scaly below, with a line of pale bristle-like hairs on the midrib beneath.

It was introduced by M. MAURICE DE VILMORIN from Hupeh, where it was discovered by Dr. AUGUSTINE HENRY, after whom it is named, and was figured in the *Bot. Mag.* t. 8497.

31. PRIMULA CHIONANTHA.

Award of Garden Merit, May 19, 1924.

A 'Nivalis' Primula happy in cultivation is a rarity, yet this noble plant of the most noble section of a beautiful genus has made itself at home in a good many English gardens. One hesitates to say with such a plant that the proper conditions for its cultivation are "so and so." Moist, rich, well-drained soil should suit it, and not more than partial shade. It was found by Mr. GEORGE FORREST in Yunnan in open alpine meadows on the mountains of the Chungtien Plateau at an elevation of 12,000 to 13,000 feet. It has rosettes of smooth oblanceolate entire leaves with more or less yellow farina. When in health the leaves may attain 10 inches in length and 2 in width, and from the middle of the rosette is produced, in June or July, a scape up to 16 inches or more in height, bearing a terminal umbel with 2 or 3 whorls of snow-white flowers beneath. The flowers are about $\frac{3}{4}$ inch in diameter, and are fragrant. Occasionally a slight blue tinge is evident in the flower. Slugs, alas, are fond of it!

32. CYDONIA JAPONICA SIMONSII.

Award of Garden Merit, May 19, 1924.

A deep scarlet form of the well-known *Cydonia japonica* (*Pyrus japonica*), the best colour form of a beautiful group, and requiring the same conditions as *Cydonia japonica*.

33. PRUNUS AVIUM fl. pl.

Award of Garden Merit, May 19, 1924.

The double-flowered Gean is the most beautiful of cherries, and perhaps the most beautiful of hardy trees when in flower. It is too large for the small garden, for it will grow to 50 or 60 feet in height, with a spread of branches of 30 feet or more. Its straight, stout stem with shining peeling bark and its wide-spaced branches, forming when young a pyramidal and later a great, more or less rounded head, make it a desirable tree at any time; its size and large-toothed leaves, somewhat hairy beneath, distinguish it from the double form of the sour cherry, *Prunus Cerasus*. It never fails to produce its flowers in abundance in clusters along the wood of the previous year and from spurs on the older growths. The flowers are very double,

so that fruit is never formed, lasting well and perfectly white. A large tree is a possession to cherish and in flower worth miles of travel to see. At Wisley the old tree planted some forty-five years ago always flowers freely and follows its beautiful companion *Prunus subhirtella pendula*. It is not particular as to soil, although it does not like disturbance at the roots, and an occasional top-dressing of good soil is a help to it.

34. *BUDDLEIA ALTERNIFOLIA*.

Award of Garden Merit, June 30, 1924.

Buddleia alternifolia was raised from seed sent home by Mr. FARRER in 1914. It is described fully in our JOURNAL, 47, p. 192, with a photograph.

35. *HYPERICUM PATULUM FORRESTII*.

Award of Garden Merit, June 30, 1924.

This beautiful variety of *Hypericum patulum*, raised from seed collected by Mr. FORREST, is described and figured in our JOURNAL, 48, p. 234.

36. *ERICA* × *DARLEYENSIS*.

Award of Garden Merit, December 1, 1924.

It has often been noted that some of the best of our garden plants have originated "by chance," and this is a good example. It is a hybrid which appears in Messrs. JAMES SMITH's heath nursery in Darley Dale, and was widely distributed by them under the name *E. mediterranea hybrida*. Mr. BEAN has given it a distinct name, and has so happily connected the plant with its birthplace. Its foliage is like that of its two parents, *E. carnea* and *E. mediterranea*, but it has the spreading habit of the former with the influence of *E. mediterranea* in the height to which it reaches (about 2 feet). A single plant at Wisley measures nearly that in height and about 4 feet 6 inches in diameter. It flowers a full month earlier than *carnea*, commencing to open its flowers in November and continuing in bloom until May, so overlapping the flowering time of the summer and autumn heaths, and, unlike many of that desirable group, it shares with *E. carnea* a tolerance for lime.

37. *PRUNUS SUBHIRTILLA AUTUMNALIS*.

Award of Garden Merit, December 1, 1924.

Mr. THOMAS SMITH, who introduced through his Newry Nursery so many good things, introduced this from Japan. It was first called *Prunus Miqueliana*, but it is clearly not that; then *P. microlepis*, but now it has been recognized as an autumn flowering variety of *P. subhirtella*, the type to which the beautiful weeping cherry of Japan

also belongs (see p. 98). Its peculiar value lies in its pleasant habit of flowering in November and at intervals through winter. Occasionally it delays flowering until spring, but in normal weather is in full flower long before Christmas. Its small fragrant pinkish flowers are usually rather double, and they open well in water if the budded shoots are cut and brought into a warm room. In this, of course, they are like the almond and the peach, the Forsythia, and the " Flowering Currant."

NEW OR NOTEWORTHY PLANTS IN THE SOCIETY'S GARDENS.—VI.

By F. J. CHITTENDEN, F.L.S., V.M.H.

20. DIMORPHOTHECA PLUVIALIS *Moench.*

EARLY in 1924 Mr. R. H. COMPTON of Kirstenbosch sent to Wisley several South African plants and seeds with a request that some of them might be grown and sent to the South African section of the British Empire Exhibition at Wembley. This was done, and among them were some especially worthy of note for some peculiar beauty which they possessed. The present species was one of them. It is by no means new to our gardens. It was in fact introduced in 1752, but is not grown to nearly the extent it deserves. The plant is annual and it is best grown by sowing the seed in heat in March, pricking out, and transplanting into a well-drained position in which to flower. The plants, which may reach 18 inches in height, should have at least 15 inches between them, and that they will cover, for they are of rather spreading habit. The oblong leaves are somewhat hairy as a rule, and the flower-heads are about $2\frac{1}{2}$ inches across, with a yellow disk in which the florets have lilac anthers and rays white within (with a more or less well-marked ring of lilac round the disk), purplish lilac without. They close rather early in the afternoon and during dull weather, and this is somewhat of a drawback. They were grown as pot plants in "24" pots at Wisley in the plant-house, and proved very satisfactory pot plants so long as they were not permitted to go to seed. The plant is a variable one, and the lilac ring which adds so much to the appearance of the flowers is often not very well defined. The plant was described by LINNÆUS under the names *Calendula hybrida* and *C. pluvialis*, and seed is offered in this country now under the latter name. It has also been described as *Calendula decurrens*, *Dimorphotheca annua*, *D. hybrida*, *Meteorina gracilipes*, and *M. crassipes*. The generic name refers to the two different forms of fruit produced by each head, the ray florets being followed by warted fruits, the outer disk ones by smooth, the inner disk florets being sterile. It is said to be a common plant in the western parts of the Cape in sandy soil. There are figures in SWEET'S "British Flower Garden," t. 39, and in MILLER'S "Icones," t. 75, fig. 1, and t. 79, fig. 2. An Award of Merit was given to the plant at Vincent Square on June 24, 1924.

21. CHAREIS HETEROPHYLLA *Cass.*

This also is not a "new" plant and came from the same source. It may be grown in exactly the same way, but needs only a "48"

pot and about 9 inches of space in the ground. It may be sown outdoors in April and thinned to the necessary distance. It is indeed well-named, for it has beautiful flowers of a very charming shade of blue, and the bushy plants in full flower are a great adjunct to the annual border. It is better known than the last and seed is often offered under the name *Kaulfussia amelloides*, under which name it was figured in the "Botanical Register," t. 490. This name is also used at times for *Felicia Bergeriana*, and *Chareis heterophylla* seems also to have been called *C. caerulea*, *C. Neesii*, and *C. pilosella*, probably because of the somewhat small variations to which it gives rise, one of the principal of which is that at times the disk florets are yellow sometimes blue. It was introduced in 1819.

DAHLIAS AT WISLEY, 1924.

Of the 145 varieties of Dahlia grown at Wisley in 1924, 44 were recommended for trial by the Joint Committee of the R.H.S. and the National Dahlia Society, sitting in London in 1923, one was raised from seed,* and 100 were reserved from former trials for comparison and to act as standards for judging. These had mostly received some award or were being grown for a second year.

The plants were all raised from cuttings and were planted in threes on the site occupied by the Dahlias for the past four years, the ground being well dug, but receiving no manure. They were planted out on June 10 and, as in most places, made slow progress at first, but later grew well (the earlier flowers being removed before they developed), and from the third week in August until they were destroyed by frost on October 24 they made a great show in the garden. The Committee inspected the plants on September 16 and made recommendations for awards.

A comparison of the plants now available for garden decoration with those grown in the first year of the present series of trials emphasizes the marked improvement that has taken place in the type of plant in this short space of time. Few of those grown failed to show their flowers to advantage, and few had weak flower stalks. The raisers are evidently discarding many seedlings which, though they have shapely flowers of good colour, bear them on plants of poor habit, and it was to encourage this act of sacrifice that the present system of making awards was adopted. There is still room for improvement in some sections, particularly in the 'Cactus' group, but on the whole progress has been excellent, and it is reflected in the increased use now made of the Dahlia in public parks and gardens, as well as in the increasing store set upon them for private gardens and for cutting. Great use is now made on the Continent of the flowers for house decoration, and many of our English varieties are better suited for the purpose than those mainly used there. Too often the Continental florists appear to find it necessary to reinforce the flower stalk with wire, but that is quite unnecessary with most of the varieties that have recently secured awards here.

A word or two on the method of staking in use at Wisley may not be out of place, for all the taller Dahlias—since their stems are brittle and their foliage large—need secure staking. Soon after they are planted out a stout stake is placed close to the main stem of each plant, being forced well into the ground and projecting to the height

* No. 15 was raised from seed from Messrs. Rivoire. The plants were different in colour, as was expected, but the flowers were of the type known as 'Stella' (French Star), similar in shape to the variety 'Etoile de Foch' sent by the same firm and grown in the trials in 1921. (See JOURNAL R.H.S., 47, p. 58.)

of three to five feet, according to the stature of the variety being dealt with. To this stake the growths as they develop are looped with raffia, this attention being continued until flowering time, the ties being made so that the rapidly swelling growths are not constricted. For the rest, the prompt removal of faded flowers to stop seed production is essential to continued flowering.

In the following notes, only the varieties now first grown are described, and only where an older variety has received a higher award than before is it mentioned. The name in brackets following the name of a variety is that of the sender to the trials and is in almost every case that of the raiser as well.

* AWARDS, DESCRIPTIONS, AND NOTES.

Class I. SINGLE DAHLIAS.

AWARDS.

Little Jenny, A.M. September 16, 1924. Raised and sent by Messrs. W. Treseder of Cardiff.

Nanno, A.M. September 16, 1924. Raised and sent by Messrs. Treseder (H.C. 1923).

Amber to crimson-carmine.

Little Jenny (Treseder), A.M.—4 feet. Flowers of type A; 2½ to 3 inches; bright amber, tipped soft rosy-amaranth with crimson-carmine band around disc; free, erect on 6- to 12-inch stems, carried well above foliage.

Scarlet.

Nanno (Treseder), A.M.—See JOURNAL R.H.S., 49, p. 62.

Class III. COLLERETTE DAHLIAS.

AWARD.

Mrs. M. Perry, H.C. September 16, 1924.—Raised and sent by Messrs. Treseder.

Orange-scarlet.

Mrs. M. Perry (Treseder), H.C.—4½ feet. Flowers 4 to 4½ inches; bright scarlet shaded orange, collar tipped white; free, erect, well above foliage on 9- to 15-inch stems.

Class IV. ANEMONE-FLOWERED DAHLIAS.

ATTRACTIVE (Ladhams).—3½ feet. Flowers 3 inches diameter; pale tyrian-rose on rhodamine-purple ground, tubular florets of a redder shade; fairly free, erect, just above foliage on erect 10- to 12-inch stems.

Class V. PEONY-FLOWERED DAHLIAS.

AWARD.

The Rose, A.M. September 16, 1924. Raised and sent by Messrs. Velthuys of Holland (H.C. 1922).

Pink.

THE ROSE (Velthuys), A.M.—See JOURNAL R.H.S., 48, p. 101.

Mauve.

SYLPH (Burrell).—4½ feet. Flowers 5 to 6 inches diameter; pale amaranth-pink; free, erect on 6- to 10-inch stems.

VIOLETTA (Burrell).—5 feet. Flowers 5 inches diameter; bright mallow-purple; free, erect on 12- to 15-inch stems.

* For previous awards in this series of trials, see vol. 49, p. 50, where the various classes are defined.

Class VI. SMALL-FLOWERED PÆONY-FLOWERED DAHLIAS.

AWARDS.

Rosie, A.M. September 16, 1924.—Raised and sent by Messrs. Burrell of Cambridge (H.C. 1921).

Sweet, A.M. September 16, 1924. Raised and sent by Mr. A. J. Cobb of University College Gardens, Reading.

Charmer, A.M. September 16, 1924. Raised and sent by Messrs. Burrell.

Norah Bell, A.M. September 16, 1924. Raised and sent by Messrs. Burrell (H.C. 1922).

Gwynne, A.M. September 16, 1924. Raised and sent by Messrs. Burrell.

Nutfield Priory, H.C. September 16, 1924. Raised and sent by Messrs. Cheal of Crawley.

Vimy, H.C. September 16, 1924. Raised and sent by Messrs. Cheal.

Yellow.

EMILY (Burrell).—3 feet. Flowers 4 inches diameter; satiny picric-yellow; free, on erect stalks, 8 inches long.

Orange.

NUTFIELD PRIORY (Cheal), H.C.—5½ feet. Flowers 4 inches diameter; lemon-chrome shaded scarlet; free, on erect 12-inch stalks.

Pink.

ROSIE (Burrell), A.M.—See JOURNAL R.H.S., 47, p. 64. Sent also by Messrs. Jarman under the name 'Rosie Supreme.'

SWEET (Cobb), A.M.—4½ feet. Flowers 3½ to 4 inches diameter; pale rose-pink with crimson-carmine base; very free, on erect 10-inch stalks.

KITTY (Burrell).—4 feet. Flowers 3 to 3½ inches diameter; deep rose-pink, with crimson-carmine base; free, on erect 6- to 8-inch stems.

Carmine-rose.

CHARMER (Burrell), A.M.—See JOURNAL R.H.S., 49, p. 64.

Orange-scarlet.

DEFENCE (Cheal).—4½ feet. Flowers 4 inches diameter; bright orange-scarlet; free, erect, just above foliage, stems 10 inches long.

NORAH BELL (Burrell), A.M.—See JOURNAL R.H.S., 47, p. 64.

VIMY (Cheal), H.C.—4½ feet. Flowers 3½ to 4 inches diameter; bright orange-scarlet, tipped rhodamine purple; free, on erect 10-inch stems.

Crimson.

GWYNNE (Burrell), A.M.—5 feet. Flowers 3½ to 4½ inches diameter; deep crimson; carried well above foliage on 8- to 14-inch wiry stems.

Class VIII. DECORATIVE DAHLIAS.

AWARDS.

Polar Bear, A.M. September 16, 1924. Raised by Messrs. Howard & Smith of Los Angeles, U.S.A., and sent by Mr. E. Beckett.

Emblem, A.M. September 16, 1924. Raised and sent by Messrs. Burrell.

White.

POLAR BEAR (Beckett) A.M.—4½ feet. Flowers 5 to 6 inches diameter; white; free, stems erect, 10 to 12 inches long.

Yellow.

LUCIEN (Stredwick).—5½ feet. Flowers 5 to 6 inches diameter; clear martius-yellow; carried only just above foliage on erect 8-inch stalks.

Bronze and Yellow.

MRS. E. G. CANT (Stredwick).—6 feet. Flowers 5 to 6 inches diameter; buff-yellow shaded bronze, tipped white; free, erect, just above foliage on 8- to 10-inch stalks.

AMUN RA (Woolman).—5½ feet. Flowers 6 to 7 inches diameter; bright old gold flushed scarlet; fairly free, hidden by foliage, stems 10 to 12 inches long.

Pink on Yellow.

LENNY (Shoesmith).—6 feet. Flowers 5½ inches diameter; bright eosine-pink on picric-yellow ground; just above foliage on erect 10- to 18-inch stems.

EMBLEM (Burrell), A.M.—5 feet. Flowers 5 to 5½ inches diameter; bright amaranth-pink, tips picric-yellow; free, erect on 8-inch stems.

Mauve.

VICTORY (Stredwick).—5¼ feet. Flowers bright rosy-amaranth pink flushed picric-yellow; free, erect on 12- to 16-inch stems.

Crimson.

LESLIE HANCOCK (Stredwick).—6¼ feet. Flowers 5½ to 6 inches; bright crimson; free, erect on 12- to 16-inch stems above foliage.

GLORIA (Stredwick).—5 feet. Flowers 6 to 7 inches diameter; deep velvety crimson; free, erect, just above foliage, on 6- to 10-inch stalks.

DORIS TRAYLER (Stredwick).—7 feet, few sidegrowths. Flowers 6 to 7 inches diameter; deep crimson-maroon; fairly free, drooping, stems 6 to 10 inches long.

Class IX. SMALL-FLOWERED DECORATIVE DAHLIAS.

AWARDS.

Carine, A.M. September 16, 1924. Raised and sent by Messrs. Burrell.

Thursa, A.M. September 16, 1924. Raised and sent by Messrs. Burrell.

Orange.

CARINE (Burrell), A.M.—4¼ feet. Flowers 4½ inches diameter; bright deep orange shaded red; very free, erect on 12-inch stalks; well above foliage.

Carmine-red.

THURSA (Burrell), A.M.—4¼ feet. Flowers 4 to 4½ inches diameter; carmine-red; very free, well above foliage on 12- to 16-inch stalks.

Class XI. CAMELLIA-FLOWERED DAHLIAS.

AWARD.

Nelly, H.C. September 16, 1924. Raised and sent by Messrs. Carlée of Holland.

Orange terra-cotta.

NELLY (Carlée), H.C.—See JOURNAL R.H.S., 49, p. 65.

Class XIII. POMPON DAHLIAS.

White.

BETTY (Jarman).—4 feet. Flowers 2½ to 2¾ inches diameter; white flushed very pale pink, inner florets tipped pale bronzy-pink; many semi-double; free, erect, stems 12 inches long.

Yellow.

GOLD CUP (Jarman).—4¼ feet. Flowers 2½ to 2¾ inches diameter; bright deep lemon-yellow; many semi-double; free, erect on 6- to 12-inch stalks.

Crimson-maroon.

NERO (Cheal).—3½ feet. Flowers 2½ inches diameter; deep dull crimson-maroon; free, erect on 6- to 10-inch stalks.

Class XIV. STAR DAHLIAS.

AWARDS.

Haslemere Star, A.M. September 16, 1924. Raised and sent by Messrs. Cheal.

Hindhead Star, A.M. September 16, 1924. Raised and sent by Messrs. Cheal.

Reading Star, A.M. September 16, 1924. Raised and sent by Mr. A. J. Cobb.

Pink on Yellow.

HINDHEAD STAR (Cheal), A.M.—4½ feet. Flowers 3 to 3½ inches diameter; carmine-crimson on yellow at base shading to light rosolane-purple towards tips; very free, on erect 10- to 12-inch wiry stems.

Mauve.

HASLEMERE STAR (Cheal), A.M.—4½ feet. Flowers 3 to 3½ inches diameter; bright mallow-purple; well above foliage, very free, on erect 10- to 12-inch wiry stems.

Crimson.

READING STAR (Cobb), A.M.—4½ feet. Flowers 3 to 4 inches diameter; rich crimson; free, on erect 6- to 10-inch wiry stems.

Class XV. CACTUS DAHLIAS.

a. DOUBLE CACTUS.

AWARDS.

Joyce Goddard, A.M. September 16, 1924. Raised and sent by Messrs. Jarman.

Mrs. Forester Paton, A.M. September 16, 1924. Raised and sent by Messrs. Cheal (C. 1921).

White.

HENRY WOOLMAN (Shoesmith).—5½ feet. Flowers 5 to 6 inches diameter; white; only just above foliage, free, on erect 6-inch stalks.

White speckled purplish-crimson.

ZEBRA (Stredwick).—5 feet. Flowers 5 to 6½ inches diameter; white, irregularly speckled with purplish-crimson; not above foliage, free, on erect 6- to 10-inch stalks.

Yellow and Scarlet.

JOYCE GODDARD (Jarman), A.M.—5 feet. Flowers 4 to 5 inches diameter; bright picric-yellow, flushed towards tips bright scarlet; just above foliage, very free, on erect 6- to 9-inch stalks.

Bronze.

ELSIE PRIOR (Stredwick).—5½ feet. Flowers 5 to 6 inches diameter; pinkish-buff on lemon-yellow ground, tips paler; only just above foliage; free, on erect 6- to 12-inch stalks.

EDITH L. JONES (Stredwick).—6 feet. Flowers 5 inches diameter; old gold shaded rosy-bronze, just above foliage; fairly free, on erect 8-inch stalks.

Pink.

MISS ECKERT (Stredwick).—6½ feet. Flowers 5 to 6 inches diameter; pale amaranth-pink; drooping; not above foliage; free, stems erect 12 to 14 inches long.

GOSSAMER (Stredwick).—6 feet. Flowers 5 to 6 inches diameter; pale rose-pink, tips paler; drooping; florets very narrow; fairly free, only just above foliage; stems 6 to 10 inches long.

Pink on Yellow.

WINNIE HARDY (Shoesmith).—5½ feet. Flowers 4 to 5 inches long; bright rosy-carmine on yellow, tips lemon-yellow, somewhat drooping; free, on 6- to 12-inch stalks.

Coral.

THOMAS WANT (Stredwick).—6 feet. Flowers 5 to 6½ inches diameter; bright deep coral, only just above foliage; free, erect on 12- to 14-inch stalks.

Crimson.

ALBERT E. AMOS (Stredwick).—6 feet. Flowers $4\frac{1}{2}$ to 5 inches diameter ; bright pale crimson, only just above foliage ; free, erect on 6- to 12-inch stalks.

MRS. FORESTER PATON (Cheal), A.M.—See JOURNAL R.H.S., 47, p. 72.

Crimson-carmine.

PERISCOPE (Stredwick).—6 feet. Flowers 6 to 7 inches diameter ; crimson carmine, drooping, not above foliage ; free, on 12- to 15-inch stalks.

b. SEMI-DOUBLE CACTUS.

Yellow.

LYDIA (Turner).—4 feet. Flowers 4 inches diameter ; pale lemon-yellow ; drooping ; free, on 10- to 12-inch stalks.

Carmine-cerise.

THOMAS EWBANK (Cobb).— $4\frac{3}{4}$ feet. Flowers $4\frac{1}{2}$ inches diameter ; bright carmine-cerise, tips paler ; well above foliage ; free, on erect 10-inch stalks.

SWEET PEAS AT WISLEY, 1924.

THE trial of Sweet Peas begun in 1921, and continued in 1922 and 1923, was concluded in 1924, the colour groups grown being white, cream, crimson, and maroon. The method of cultivation was precisely as in the earlier years, and was again most successful.

One hundred and one stocks were sent for trial, and, with the exception of three which belonged to groups not mentioned above, and three unnamed seedlings of other groups, they are described below.

The plants were put out on April 22, and examined by the Floral Committee on several occasions, judgment being finally passed on July 23, when the plants were in full bloom.

AWARDS, DESCRIPTIONS, AND NOTES.

I. WHITE VARIETIES.

AWARDS.

King White, A.M. July 23, 1924.—Raised by Mr. A. Malcolm and sent by Messrs. J. K. King, Coggeshall. (A.M. 1913, Dobbie.)

Mascotts White, A.M. July 23, 1924.—Raised and sent by Messrs. Ireland & Hitchcock, Marks Tey. (A.M. 1919, Ireland & Hitchcock.)

Edna May Improved, A.M. July 23, 1924.—Raised by Mr. F. C. Woodcock and sent by Messrs. Ireland & Hitchcock.

Joan Ryder, A.M. July 23, 1924.—Raised by Mr. R. Bolton and sent by Messrs. Ryder, St. Albans.

Constance Hinton, A.M. July 23, 1924.—Raised by Dr. H. T. Hinton and sent by Messrs. A. Dickson, Newtownards; Dobbie, Edinburgh; and Mr. W. J. Unwin, Histon.

WHITE LADY (Stevenson).—White; flowers large, in fours on 12-inch stalks; plants very vigorous. Raised by sender.

* * *

FLORENCE WRIGHT SPENCER (Unwin).—White; flowers large, in threes on 13-inch stalks; plants vigorous. Raised by Messrs. Stark.

ANGLIAN WHITE (W. H. Simpson).—Too much like 'Florence Wright Spencer.' Raised by Messrs. E. W. King.

SNOWDRIFT (R. Veitch).—Much like 'Florence Wright Spencer.' Raised by sender.

JUNE BRIDE (Elliott).—Characters as for 'Florence Wright Spencer,' but flowers in fours on 12-inch stalks. Raised by sender. Stock not quite true.

* * *

EDNA MAY IMPROVED (Ireland & Hitchcock), A.M.—White; flowers large, in threes, many fours, on 14-inch stalks, of a thicker texture than 'King White'; plants vigorous.

EDNA MAY IMPROVED (Unwin, A. Dickson, Woodcock, W. H. Simpson).—Similar to last, but less good stocks.

EDNA MAY (Dobbie).—Similar to 'Edna May Improved,' but a less good stock.

KING WHITE (J. K. King), A.M.—Characters as for 'Edna May Improved,' but flowers of a thinner texture.

KING WHITE IMPROVED (A. Dickson).—Similar to last, but a less good stock.

MASCOTTS WHITE (Ireland & Hitchcock), A.M.—Much like 'Edna May Improved,' but flowers of a creamy shade.

NORA UNWIN (Dobbie).—Too much like 'Edna May Improved.'

WHITE QUEEN (Kelway, Webb).—White, somewhat tinged cream; flowers large, in fours on 12-inch stalks; plants vigorous. Raised by Messrs. Stark.

* * *

CONSTANCE HINTON (A. Dickson, Dobbie, W. J. Unwin), A.M.—White, slightly tinted pink; flowers large, in fours on 12-inch stalks; plants vigorous; node red; seeds blackish.

CONSTANCE HINTON (Hinton, Cullen, W. H. Simpson, Ireland & Hitchcock).—Like last, but stocks contained pale-pink rogues.

HAWLMARK BEDDING WHITE (A. Dickson).—Characters as for 'Constance Hinton,' but stalks 10 inches long. A mixed stock.

* * *

JOAN RYDER (Ryder), A.M.—Much like 'Constance Hinton,' but less vigorous; stalks 10 inches long, node not coloured.

II. CREAM VARIETIES.

AWARDS.

Cream Constance Hinton, A.M. July 23, 1924.—Raised and sent by Dr. Hinton, Heytesbury, Wilts.

Matchless, A.M. July 23, 1924.—Raised by Mr. Bolton and sent by Messrs. Dobbie and Ireland & Hitchcock.

Majestic Cream, A.M. July 23, 1924.—Raised by Messrs. Dobbie and sent by Mr. Unwin.

Hawlmarm Cream, A.M. July 23, 1924.—Sent by Messrs. A. Dickson.

Paradise Ivory, A.M. July 23, 1924.—Raised by Mr. Hemus and sent by Messrs. Kelway of Langport.

CREAM CONSTANCE HINTON (Hinton), A.M.—Cream; flowers large, in fours on 12-inch stalks; plants vigorous; node red.

* * *

DOBBIE'S CREAM (Dobbie, Kelway).—Cream; flowers large, in threes, many fours, on 12-inch stalks; plants vigorous. The last contained white rogues.

* * *

MAJESTIC CREAM (W. J. Unwin), A.M.—Cream; flowers large, single, few double, in fours on 12-inch stalks. A good stock.

MAJESTIC CREAM (Dobbie).—A less good stock of the last.

HAWLMARK CREAM (A. Dickson), A.M.—Like 'Majestic Cream.'

MATCHLESS (Dobbie, Ireland & Hitchcock), A.M.—Like 'Majestic Cream.'

MATCHLESS (Unwin, J. K. King, Webb).—Like 'Majestic Cream.' Stocks not true.

CLARA CURTIS IMPROVED (A. Dickson).—Too much like 'Majestic Cream,' but flowers mostly in threes.

* * *

FELTON'S CREAM (Webb).—Much like 'Majestic Cream,' but flowers of thinner texture and mostly in threes.

UNWIN'S CREAM (Unwin).—Much like 'Majestic Cream.'

* * *

CREAM MAID (Stevenson).—Cream; flowers large, in fours on 14-inch stalks; plants very vigorous. Raised by sender.

* * *

CHAMPAGNE (Cullen).—Much like 'Majestic Cream,' but flowers mostly in threes. Raised by sender. Stock not quite true.

PRIMROSE QUEEN (R. Veitch).—Much like 'Majestic Cream,' but a few flowers double and mostly in threes. Raised by sender. Stock not true.

* * *

PARADISE IVORY (Kelway), A.M.—Creamy-ivory faintly tinged pink; flowers large, in fours on 14-inch stalks. A very good stock.

III. CRIMSON VARIETIES.

AWARDS.

Maud Holmes, A.M. July 23, 1924.—Raised by Mr. R. Holmes and sent by Messrs. Barr.

Sunproof Crimson, A.M. July 23, 1924.—Raised by Messrs. Dobbie and sent by Messrs. Dobbie and Kelway. (A.M. 1910, Dobbie.)

Charity, A.M. July 23, 1924.—Raised by Mr. J. Stevenson and sent by Messrs. J. Stevenson of Wimborne, Unwin, J. K. King, Ireland & Hitchcock, Barr, and R. Veitch of Exeter.

Unwin's Crimson, A.M. July 23, 1924.—Raised and sent by Mr. Unwin.

Crimson King, A.M. July 23, 1924.—Sent by Messrs. Morse of San Francisco, Dobbie, and Webb of Stourbridge. The last was sent in error as 'Field-Marshal.'

CRIMSON GLOW (Stevenson).—Very bright crimson-scarlet; flowers large, in fours on 12-inch stalks. Raised by sender. Variable in shade.

* * *

MAUD HOLMES (Barr), A.M.—Standards rosy-crimson, wings of a rosier shade; flowers large, in fours on 13-inch stalks; plants vigorous.

SUNPROOF CRIMSON (Dobbie, Kelway), A.M.—Similar to 'Maud Holmes.'

KING EDWARD SPENCER (Kelway).—Much like 'Maud Holmes,' but growth less vigorous. Stock not true. Raised by Messrs. Burpee.

* * *

QUEEN ALEXANDRA SPENCER (Barr).—Standards bright rosy-crimson, wings of a paler shade; flowers large, mostly in threes on 12-inch stalks. Mixed with grandiflora type.

* * *

CHARITY (J. Stevenson, Unwin, J. K. King, Ireland & Hitchcock, Barr, R. Veitch), A.M.—Standards bright crimson, wings paler; flowers large, in fours on 11-inch stalks; spots with rain; plants vigorous.

CHARITY (Dobbie, Cullen, W. H. Simpson).—Less good stocks of the last. The last stock contained magenta and cerise rogues.

UNWIN'S CRIMSON (Unwin), A.M.—Too much like 'Charity.'

UNWIN'S CRIMSON (R. Veitch).—Like last, but contained cerise and maroon rogues.

* * *

CRIMSON KING (Morse, Dobbie, Webb), A.M.—Standards bright crimson, wings of a paler shade; flowers large, in fours on 12-inch stalks; plants vigorous. The last sent as 'Field-Marshal' in error.

ROY ROY (Morse).—Too much like 'Crimson King.' Variable in shade.

FIELD-MARSHAL (Dobbie).—Bright blood-crimson; flowers large, in fours on 11-inch stalks. Plants vigorous. Stock not quite true. Raised by sender.

* * *

MRS. NORMAN LAMBERT (Woodcock, Unwin).—Very deep crimson; flowers large, in threes on 12-inch stalks; burns somewhat. The last stock contained maroon rogues. Raised by Mr. Woodcock.

IV. RED-MAROON VARIETIES.

DOBBIE'S MAROON (Dobbie).—Rich reddish-maroon; flowers large, in fours on 12-inch stalks; plants vigorous. Raised by sender.

HAWLMARK MAROON (Cullen, A. Dickson).—Too much like 'Dobbie's Maroon.' Raised by Messrs. A. Dickson.

SPLENDOURE (J. Stevenson, Unwin, W. H. Simpson).—Too much like 'Dobbie's Maroon.' Raised by Mr. J. Stevenson.

V. PURPLE-MAROON VARIETIES.

AWARDS.

Nubian, A.M. July 23, 1924.—Raised by Messrs. House and sent by Messrs. Kelway. (A.M. 1911, Dobbie.)

Warrior, A.M. July 23, 1924.—Raised by Mr. J. Stevenson and sent by Messrs. Dobbie, Unwin, A. Dickson, W. H. Simpson, J. K. King, Webb, Ireland & Hitchcock.

Maroon King, A.M. July 23, 1924.—Raised and sent by Mr. F. C. Woodcock.

NUBIAN (Kelway), A.M.—Purple-maroon; flowers large, in fours on 12-inch stalks; plants vigorous.

WARRIOR (Dobbie, Unwin, A. Dickson, W. H. Simpson, J. K. King, Webb, Ireland & Hitchcock), A.M.—Like 'Nubian.'

MAROON KING (Woodcock), A.M.—Like 'Nubian.'

MAROON KING (Webb).—Similar to 'Nubian.' Contained mauve and pink rogues.

KING MANOEL (Kelway).—Like 'Nubian,' but flowers mostly in threes; mixed with crimson rogue. Raised by Messrs. Stark.

MASCOTTS MAROON (Ireland & Hitchcock).—Like 'Nubian,' flowers mostly in threes. Raised by sender.

SEEDLING H.B. 2 B. (Elliott).—Like 'Nubian.' A very mixed stock.

* * *

THE SULTAN (Dobbie, Unwin, W. H. Simpson, Webb).—Deep purple-maroon; flowers large, mostly in threes on 13-inch stalks; plants vigorous. The first stock contained maroon rogue. Raised by Messrs. E. W. King.

RAVENSWING (A. Dickson, R. Veitch).—Like 'The Sultan.' Raised by Messrs. A. Dickson.

VI. WHITE FLAKED MAROON VARIETIES.

CHOCOLATE SOLDIER (R. Veitch).—Greyish-white flaked reddish-maroon; flowers large, in threes on 10-inch stalks; plants of medium vigour. Raised by sender.

BOOK REVIEWS.

"Rhododendrons and the Various Hybrids." By J. G. Millais. Series 2. Large 4to. xii + 263 pp. Plates. (Longmans, Green, London. 1924.) £10 10s. net.

Rhododendrons, strangely enough, had until the last few years almost no literature, apart from that devoted to technical descriptions. Now several books have appeared, the largest of which, by Mr. Millais, we reviewed in this JOURNAL, vol. 43, p. 530, when it appeared in 1917. So much further information has since been acquired that the author of that book has deemed it desirable to publish a second to include this new knowledge, and he has achieved another book as large (within a few pages), nearly as heavy, and costing an additional two guineas. The edition is limited to 550 copies, each of which is numbered.

As in the former book, so here there are plates of three types—collotype and half-tone plates, both excellent of their kind, and colour plates reproduced by a photographic three-colour process. The collotype plates represent plants growing in British gardens and have a delicacy that commends them, but a black-and-white illustration which sets out to show grouping for colour effects cannot but fail of its object. To illustrate this, colour must be used, and the reproductive process chosen must be of the very best, otherwise the effect is poor, as it is indeed in practically all the coloured plates in the book. The half-tone illustrations are mainly, though not entirely, from photographs made in China by the recent botanical explorers whose names and work are so well known to readers of our JOURNAL, and are useful in showing the natural habit and surroundings of the plants depicted.

The letterpress deals generally with Rhododendrons and gives descriptions and notes on the species and hybrids.

An interesting chapter on "Modern Shrub Gardening" comes immediately after the introduction. We take little exception to what is said in this chapter, although in a book priced so highly as this care might have been taken at least to spell plant names correctly, but it seems a little out of place to deal with this general question in a book with the present title; Mr. Eley, indeed, has treated it so well in "Gardening in the Twentieth Century" that it seems unnecessary much further to enlarge upon it.

The work of Mr. Forrest and Captain Kingdon Ward is told in their own words, and like that of the late Mr. Farrer's explorations (which are partly recounted from his own writings and partly by Mr. Euan Cox, who accompanied him on part of his N.W. Burma journey), their stories are familiar to most of us from other sources.

For many of us, Rhododendron-growing is out of the question, for so many of our soils contain lime in some form or other, and lime, we

know from bitter experience, is fatal to Rhododendrons; yet all these travellers refer to the common occurrence of Rhododendrons on limestone formations, and the late Prof. Bayley Balfour suggested that the explanation might be found in the presence of a fungus mycelium in the indumentum of the leaves which perhaps collected the necessary nitrogen supply from the air as the mycorrhiza on the roots in this country does from the soil. We want the proper fungus to infect the growing plant here, and so to enable us to experiment upon this interesting problem. Are there any species actually upon limestone and yet lacking indumentum? The record of locality, even when given as fully as Forrest gives it, is not always full enough to tell us, as, for instance, in that aberrant member of the sanguineum series, *R. eudoxum*, which lacks indumentum.

Few except those who have grown numbers of them realize the immense variation to be seen within the range of one species as raised from Chinese seed, and Mr. Millais wisely draws attention to the need for selection of really good forms for cultivation. *Rhododendron Augustinii* is an example of this, for in its best form it is among the best of garden plants; but there are many bad ones about. *R. racemosum* varies greatly, and from a batch of seedlings of *R. intricatum* both good and far less good forms may readily be selected. In hybrids the same is true, for the plants of a first cross are not by any means necessarily alike.

A chapter is devoted to new hybrids, with notes on their origin and characteristics, both of habit and behaviour. *R. × Loderi* (*Fortunei × Griffithianum*), for instance, is compared with *R. × kewense* (why does the author not follow accepted usage in the method of writing trivial names?) of the same parentage, to show that the former delays growth later than *kewense*, and so escapes damage by spring frosts; but, alas, even south of London we have seen the young growths of this fine plant greatly damaged by spring frosts year after year! Space is too short to do more than indicate the completeness of the lists of hybrids raised by Sir Edmund Loder, Messrs. J. C. Williams, J. B. Stevenson, P. D. Williams, K. M'Douall, Stephenson Clarke, E. Magor, H. D. McLaren, L. de Rothschild, E. H. Wilding, and T. Lowinsky (among amateurs), at Kew, and by Messrs. Gill & Son, J. Waterer, Sons & Crisp, M. Koster & Sons, C. Vankes & Sons, and others.

Cultivation comes in for some notice, and the author wisely lays down no hard and fast rules, for what succeeds in one locality may be an utter failure in another. He also refers to the pests which attack Rhododendrons, and which are unfortunately becoming more common.

The major part of the book (pp. 75-263) is occupied by a list of Rhododendron species and hybrids, with references to descriptions of the older plants in the first volume, and additional notes where such are available, or, where more recently named species are concerned, with descriptions mainly from the *Trans. Bot. Soc. Edinburgh*. These descriptions are in English. It is very useful to have the descriptions

of these new plants within the covers of one volume, but the cost is heavy, and when one desires to discover the name of a plant without more help than this alphabetical list can give (even with its very full, often-verbose, descriptions) one cannot go far. The earlier volume was more helpful, for it gave a key. This has no key, possibly because of the enormous difficulties in making one. A great work awaits the leisure of a competent monographer who will take in hand and study and record the characteristics of the species in the herbarium and in the field for the benefit of his fellows. A vast mass of partly digested material awaits him, and if he can give a mental picture of what the "sanguineum series," the "Souliei series," and the like are, which are so freely referred to here, he will do much to show a way through this mass of names and notes—but something of that kind is wanted. The novice will go away from this big book bewildered instead of helped for the lack of some such guide. It may be, of course, that it is not intended for the novice, but, if not, then it has little real value, for the specialist knows where to lay his hand upon most of this material.

In our review of the earlier volume we drew attention to certain defects. We regret that this volume contains similar defects. Inaccuracies in little things they are for the most part, easy to avoid if time and care be expended upon them, but the capital defect seems to us to be the neglect to blaze a way through what must to all but the specialist be an impenetrable wood; and the pity of it is that it is a wood of very beautiful things.

"A Handbook of Garden Irises." By W. R. Dykes, M.A., L.-ès-L. 8vo. 250 pp. (Hopkinson, London, 1924.) 12s. 6d. net.

The author of the sumptuous volume "The Genus Iris" is, it need hardly be said, an authority second to none on his subject. But, as he explains, that work was meant primarily for botanists, while this is for gardeners. In 1911 he published a useful little handbook in "The Present-day Gardening Series," but it is now out of print. The present volume comes between its two predecessors in size and scope, and, now that this wonderful genus has at length obtained for itself the attention from amateurs which had long been owing, it should have a wide circulation. The cult of the Iris has indeed advanced very rapidly in the last few years; in the United States it almost amounts to a craze, as the amazing "check-list" of some 2,700 names testifies. Most devotees begin their worship with the "tall bearded" section, which the Americans familiarly call "T.B." These will find in Mr. Dykes' book a valuable chapter, wherein his refined taste in selecting from the almost innumerable varieties now in commerce may well be followed; but they will perhaps be surprised to observe that this chapter occupies only about a twelfth part of the book. In fact the author is evidently concerned to show how many other sections of the genus there are, nearly all of which

include species worth cultivating and presenting little difficulty, if certain simple rules are observed. Above all things the time of planting is important, and in his directions under this head, as well as in all cultural matters, the author's advice should be implicitly followed.

A complete Index makes it easy to use the volume as a book of reference, but it is also eminently readable. The plan followed (in each case an account of a section as a whole, followed by an account of each species contained in it) inevitably involves a certain amount of repetition, but this is no great harm. The author is himself greatly interested in geographical distribution; his chapter on this subject, and the problem which it raises of the comparative age of the different sections and species, will fascinate any grower who cares to know more about the plants which he grows than their names and their fitness or unfitness for his own garden. Nor is this topic without its human interest: there is romance in the well-founded suggestion that Thothmes III., about 1500 B.C., was acquainted with at least one *Oncocylus* species, perhaps the one to gather which a British officer halted his troops at El Arisch, in 1916, on their way into action; while the steps of the westward advance of the Mohammedans from Arabia to Spain are marked by the colonies of *Iris albicans* which they brought with them to plant in their cemeteries. The botanical information given is clear, adequate and untechnical. The sectional and specific names are, where possible, explained; we regret that the strange word *Oncocylus* eludes even Mr. Dykes. The emphasis laid on seeds as a basis of classification is noteworthy. It may even suggest to some readers the pastime of raising Irises from seed. In a garden in which a fair number of forms are grown together, and which is accessible to bees, it is not even necessary to pollinate the flowers, a business for which many enthusiastic gardeners cannot find time. As to hybridization, few growers, except Sir Michael Foster (*magnum et venerabile nomen* in this connexion) and Mr. Dykes himself, have tried their hand on other sections besides the "bearded." But his account of his own experiments will show how much may be done, e.g., with the bulbous sections and *sibirica* sub-section; here too, apart from deliberate experiment, anyone may with little trouble enrich his garden with new and beautiful things. Thus the bees have presented the present reviewer with a *tall chrysographes*, a hybrid (apparently) between that species and the Californian *tenax*, and purple-flowered forms of the yellow *Wilsoni*—not to mention a double-flowered *ochroleuca*, now fortunately extinct.

If a reviewer is supposed to indicate defects or mistakes in a work at once so scholarly and so scientific as this, his task is not easy. However, the printer, with a hazy recollection of Mediterranean geography, has in several places put *Cicilia* for *Cilicia*; and (an unusual shortcoming in printers) he has been very chary with his commas; in one case (p. 46) the result is to make Sir Michael Foster's name an alias of Dr. Aitchison. In a botanical work the word

"habitat" should perhaps be used only in its strict sense, which is oecological, not geographical.

The illustrations are in most cases admirably reproduced from beautiful drawings by Miss E. Kaye, mostly done from the living plant.

"A Handbook of *Crocus* and *Colchicum* for Gardeners." By E. A. Bowles, M.A., V.M.H., F.L.S. 8vo. xii + 185 pp. (Hopkinson, London, 1924.) 12s. 6d. net.

The first of this series of books was the one reviewed above; this is the second. They set a high standard for those that are to follow.

It is by no means easy to discuss the botanical and the cultural characteristics of a long series of plants in such a way as to be of interest and value to the cultivator, who must know what a plant requires and how it grows, and usually desires to know what properly to call it. Here he will find aids in both directions, set out clearly and pleasantly. He will find also what is known and will learn how much is yet to be found. The book should set him to work to grow both *Crocuses* and *Colchicums*, that he may enjoy the pleasure of seeing some of the delightful gems which so many gardens so strangely neglect.

Everyone admires the Dutch *Crocuses*, white and purple and yellow, in the mass, but only those who have grown and watched the less known wild forms can realize the grace and beauty of form and colouring that these flowers possess. If only the weather were always perfect when they flower English gardens would certainly contain many more of them. Mr. Bowles has shown, however, along with a few other enthusiasts, that some of these wild forms if raised from seed will give forms more various and beautiful than themselves. *Crocus chrysanthus*, for instance, has given a race of children of wonderful vigour and beauty, and without that air of solid, prosperous respectability that sometimes mars the forms of *C. vernus*. He has worked with and selected from other species as well, and has shown enough to whet the seeker for new things to go and do likewise. The seeker in out-of-the-way corners of the Mediterranean area, the stay-at-home garden lover, the man who wants to improve upon Nature, and now and then the epicure in cultivation whose delight lies only in attempting the very refractory, all will find something to occupy them in the genus.

The other genus which comes in for the many shares of attention is *Colchicum*—to which many of the so-called autumn *Crocuses* belong—and here, even more than in the genus *Crocus*, new light is cast, for less has been written about them heretofore. Many of them it is true have one capital fault, but that can be forgiven them for their beauty, at any rate in spacious gardens or in meadows or orchards where no cattle come. Certainly those who know the beauty of *C. speciosum* in its many forms, or the rare *C. Sibthorpei*, would not willingly forgo the pleasure of seeing them annually when other

flowers are becoming scarce. And there are several species we want, especially of the spring-flowering types, which perhaps this book may send someone out to secure.

No one reading the book for pleasure or for information will be sent empty away. The keys showing how the species may be distinguished from one another are especially useful in the genus *Crocus*, where it is often so difficult to find one's way, and the drawings, which are all well produced, from the author's own facile pencil, are excellent examples of what such drawings ought to be.

"*Mediæval Gardens, 'Flowery Medes,' and other arrangements of Herbs, Flowers, and Shrubs grown in the Middle Ages, with some account of Tudor, Elizabethan, and Stuart Gardens.*" By the late Sir Frank Crisp, Baronet, LL.B., B.A., Treasurer and Vice-President of the Linnean Society of London [1881-1905]. Edited by his daughter, Catherine Childs Paterson. With illustrations from original sources collected by the author. 2 vols. 4to. xiv + 140 pp., figs. cccxiv. (John Lane, The Bodley Head, Ltd., London, 1924) £6 6s. net.

Visitors to the famous garden of the late Sir Frank Crisp, Bt., will remember his whimsical guide-book with its quaint woodcuts. The fourth edition, issued in 1914, has a "Part II. Illustrations of some Mediæval Gardens: and of a few Tudor, Elizabethan, and Stuart Gardens, in which some of the Characteristics of Mediæval Gardens are Found." This volume is clearly a preliminary attempt to arrange the large collection of illustrations of the subject gathered during many years' search by the author. During the later period of his life, Sir Frank Crisp employed himself drawing up an account of the subject, and arranging the illustrations after preparing a series of half-tone blocks ready for the printer. This series of more than 500 blocks only needed the completion of the text, which, after the death of the author in 1919, was undertaken by Mrs. Paterson from his notes and hasty transcriptions out of his extensive library. By the time this had been done the books had to be sold by Sotheby's, so the task of collation was a difficult and troublesome one, requiring time for its performance and reference to many libraries.

After giving a list of plants grown in very early times, the size of the gardens, their enclosing fences, the beds and their sparse planting, "knots" and parterres, labyrinths and mazes, arbours, pergolas and "galleries," artificial mounts, fountains and bathing pools, the gardens belonging to monasteries and castles are particularized, the text closing with a bibliography of authorities quoted, and an index.

The wealth of illustrations in these volumes marks them off from previous attempts to portray garden life in the Middle Ages; the artists drew the gardens of their time, even when essaying the Garden of Eden, or Gethsemane, no attempt being made to reproduce the actual surroundings of Oriental happenings. These records will be a source of information for all who wish to realize the small scale and cramped ideas of the citizens and nobles of the Middle Ages.

"ABC of Tomato Culture." By W. Dyke.

This book covers very thoroughly not only the practical growing of tomatoes on up-to-date lines, but combines also (in plain language) sufficient of the theory and practical treatment of diseases, pests, etc., as to make it of very great service alike to the beginner and to the advanced grower. In the opinion of the reviewer it is the best work on the subject yet published.

"Soils and Crops." By J. H. Gehrs. 8vo. viii + 444 pp. (Macmillan, New York, 1924.) 6s. 6d. net.

This is a book of American horticulture, and contains a short section dealing rather briefly with vegetables and fruits from the American point of view.

"Flower Foes." By T. W. Sanders. 8vo. iii + 140 pp. 51 figs.; 43 plates, including 20 coloured. (Collingridge, London, 1924.) 4s. net.

This book is a companion volume to "Fruit Foes" (R.H.S. JOURNAL, vol. 48, p. 141) and "Vegetable Foes" (R.H.S. JOURNAL, vol. 49, p. 131). It is splendidly and adequately illustrated, the colour plates being the work of Miss Kate Ashley. The text illustrations are good, but on p. 63 the figure of the cockchafer is incorrectly named, and should be labelled the rose-chaffer (*Cetonia aurata*).

There are eight chapters, devoted to flower foes, greenhouse foes, garden friends, sprayers and spraying, insecticides and fungicides, soil sterilization and greenhouse fumigation.

Both insect pests and fungus diseases are included, arranged under their respective hosts. Other injurious animals mentioned are woodlice, eelworms, birds, rodents, etc.

Some improvement could be made by collecting together some of the pests; e.g., under the heading Rose, the several species of sawflies are scattered and placed between fungus diseases.

Some notable omissions are: the tarnished plant-bug (*Lygus pratensis*), which is by far the most serious pest of chrysanthemums; the rhododendron-bug (*Stephanitis rhododendri*), and the cineraria leaf-miner. With regard to suggested remedial measures, there is no mention of the hot-water treatment for Narcissus bulbs infected with eelworm, and no warning is given of the danger from fumigating chrysanthemums and cinerarias with tetrachlorethane.

The advice given for stopping an attack of carnation-fly would prove to be rather wearying, for it would be much quicker to pinch the infected leaves between the fingers than to pick the larvæ out by means of a darning needle!

This book can be confidently recommended for all flower growers who wish to see their plants growing with a clean bill of health.

"Insect Pests." By E. T. Ellis. 8vo. vii + 156 pp. (Allen & Unwin, London, 1924.) 3s. 6d. net.

This small book is divided into four parts: (i.) pests of vegetables, (ii.) pests of fruit, (iii.) pests of flowers, and (iv.) Colonial, Continental, and forest pests.

The chapters deal with groups of pests arranged under their host plants.

Descriptions of the pests and their life-histories either are omitted or are too meagre for correct identification, and the omission of the symptoms of attack is to be deplored.

In a book of this description a great deal of valuable space is taken up with reiteration and promises of proposed research, whilst the section on Colonial and Continental pests could be profitably omitted.

Many of the suggested remedies are antiquated, and some are useless—e.g. the recommendation to sack-band fruit trees in February or March against Codling-moth.

There are many errors. Some typical ones, taken at random, are: On p. 99 we read of the fruit-tree louse, which is said to be responsible for the death of a large number of fruit trees, but we fail to recognize this frightful depredator of orchards; again (p. 100), a suggested remedy for the larvæ of Goat-moth in trees is to insert a stick (l) of sodium or potassium cyanide into each of the holes made by the larvæ; the chrysanthemum-fly (p. 112) is likened to a domestic fly; and on p. 92 the author confidently recommends for the raspberry-beetle the application of lead arsenate wash as the flowers open! Further comments are needless.

"From China to Hkamti Long." By F. Kingdon Ward. 8vo. 317 pp. (Arnold, London, 1924.) 18s. net.

This is an exceedingly interesting book. Although the author has written on this part of the world before, this volume contains much that is new.

By the vivid descriptions of local customs, the accurate notes on the plants, and by the detailed records of the insects necessary for the propagation of the species, Mr. Ward proves himself to be an observant explorer.

He makes rather too light of his personal discomforts and privations. Fascinating as the country appears from the pages of this book, I know of more comfortable conditions of passing a night than lying on the bug-begotten floor of a Tibetan stable under a leaking roof. Whilst telling us that the inhabitants of Tali eat the flowers of *Rhododendron decorum*, it is a pity Mr. Ward does not give us the recipe for serving them. The plant is very floriferous in this country, and, whatever the flavour may be, I can imagine no more appetizing looking dish than a bowlful of these beautiful and fragrant blooms.

The book is well turned out and contains many interesting illustrations, and that most essential addition, a clear map of the itinerary.

Altogether the book is a valuable addition to the literature on the Tibetan Frontiers.

"White Clover (*Trifolium repens* L.): A Monograph." By A. G. Erith, B.Sc. 8vo. x + 150 pp. (Duckworth, London, 1924.) 18s. net.

Of interest mainly to agriculturists: an excellent account of the structure and development of the plant and of the variations to which it has given rise.

"A Real ABC of Gardening." By A. J. Macself. 8vo. 215 pp. 37 illustrations, including 4 in colour and 5 in half-tone. (Thornton Butterworth, Ltd., London, 1924.) 6s. net.

This book is written for "those who come entirely fresh to the work of gardening," and it therefore deals with elementary matters. But the field which the author has attempted to cover is a very wide one, including the principles of gardening, soils, manures, garden construction, the cultivation of vegetables, fruits, and flowers, propagation, greenhouse management, etc., and we think that even if one dispensed with a chapter on the advantages of a garden and got down to business straight away it would not be possible in a book of this size to write on all these subjects with that wealth of detail for which the beginner naturally yearns. Separate chapters are devoted to "Making a Lawn," "The Culture of Tomatos and Cucumbers," and "Budding Roses," but we think that many other matters are dealt with far too briefly to be of much value to anyone just taking up gardening.

Apart from its brevity we have little fault to find with the advice given, but one or two things are definitely wrong. Thus on p. 155, under the heading of "Grease Banding," the author appears to have mixed up the Winter and Codling moths, for the eggs of the Winter moth are said to "produce the maggots that eat away at the apple until they tunnel from the core to the surface. . . ." And we cannot agree that, when making cuttings of "roses" and "most hard-wooded shrubs, it is advisable to scoop out the 'eyes' on the lower half of the cutting. . . ."

The author has quite rightly endeavoured to avoid very technical language, and has succeeded, as a rule, in finding simple yet accurate terms. But accuracy has been sacrificed on p. 16, where epiphytic orchids are said to be "parasitical," and on p. 17, where roots are credited with "mouth-like organs." In future editions it would be well to correct the spelling of plant names such as "Siberica" and "esculentea," and to use capital initial letters for all generic names and such specific ones as need them.

The book is well printed, and has an index. The half-tone illustrations and most of the line drawings are good, but neither the two coloured illustrations of particular plants nor the two illustrations of pruning appear to be of much use to beginners.

"Manures and Fertilisers." By W. Dyke. 8vo. 138 pp. (Collingridge, London, 1924.) 4s. net.

This little book is full of sound advice so far as the author's own work is concerned, and it will be found useful by all who grow flowers, vegetables, and fruits. The last few pages are occupied by formulæ for the manuring of many different plants, most of which require no special treatment if the soil is kept in a good state of fertility.

"Descriptive Labels for Botanic Gardens." By H. Gilbert Carter. 80 pp. Oblong sm. 4to. (Cambridge, 1924.) Paper covers, 1s. 6d. net.

This is a series of labels intended to be printed and attached to plants in Botanic Gardens for the information of the public, concerning the name, family, origin, and uses of the plant labelled.

"Delphiniums." By A. J. Macself. 8vo. 31 pp. ("Country Life," London, 1923.) Paper covers, 9d. net.

The advice given upon the cultivation of these favourite plants is thoroughly sound and comprehensive, and those who follow it are not likely to regret their adherence to its text. Descriptions of the best-known varieties are given.

"The Secrets of Many Gardens." By Mrs. Philip Martineau. 8vo. 307 pp. (Williams & Norgate, London, 1924.) 12s. 6d. net.

The title of this book is highly misleading, as it reveals no secrets and does not offer a single instance of fresh information on any subject connected with gardening. The reader is shunted from America to England and back again—taken all over the Continent to see the most common everyday plants. Many of the chapters were written years ago and have appeared in various periodicals, so that it is rather amusing to see an invitation to the reader to inform the author if there are better varieties of carnations than 'Raby Castle' or 'Audrey Campbell.' But if the varieties of carnations are a little antiquated the Dahlia list is quite up to date, though the names are in several cases misspelt.

There is a most misleading chapter on the prospects for lady-gardeners. The author is of opinion that it is not possible for the lady-gardener who is content to remain a working gardener to earn enough to keep her, but if she learns landscape gardening and town planning her prospects are good. No proof of this statement is given, and much might be said about the disappointment of many women who have spent much time and money on learning the business, with the most unsatisfactory results.

The incapable and dishonest gardener (male) has a chapter nearly all to himself, and to evade this terrible secret commission business and the high prices of the home seedsmen, the author for some years sent her orders abroad. It appears that our seedsmen are not nearly so honest a class as our nurserymen, but we are spared an opinion of those who sell both seeds and plants.

The statement that hardly any seeds except new varieties of peas—sweet and culinary—are grown in England is much short of the truth.

"Secrets of Many Gardens" is a book of little value to garden owners. To those interested in gardens it may pass away a pleasant hour. It is nicely printed and the photographs are good.

"Lawns, Links and Sportsfields." By J. Macdonald. 8vo. 78 pp. ("Country Life," London, 1923.) 5s. net.

Anything from the pen of Mr. Macdonald on Lawns and Grasses will receive respect from all quarters.

The book opens with a chapter on drainage, sound and practical, and it is no adverse criticism to say that some of the finest lawns in this country are without any drains at all.

From drainage we are taken to cultivation, and here no elaborate rules are laid down. All is sound and easy of execution. The chapter on levelling will be a great help to many amateurs and professional gardeners. The chapter on the selection of species is less satisfactory, and more ought to have been said about city lawns. This is dismissed in twelve lines, and the paragraph is opened by the somewhat misleading statement that few grasses will succeed in towns. One of the best is not mentioned—*Poa nemoralis*.

Succeeding chapters deal with sports grounds, golf, cricket and bowling greens. It is difficult to understand the author's objection to hard grasses such as *Festucas*, as *Festuca ovina* is a first-rate species for this class of sports ground, and wears better than any other.

The chapter on pests and troubles deals effectively with nearly all the ills that a lawn is heir to. The work closes with a chapter on manuring. The old-time method still most effective and practised by not a few is a top-dressing of vegetable matter in winter or sifted stable manure. Mr. Macdonald does not recommend this, but it is still the plan adopted and which keeps in perfect condition some of the finest turf areas in the country.

"Rhododendrons for Amateurs." By E. H. M. Cox. 8vo. 112 pp. ("Country Life," London, 1924.) 5s. net.

The number of rhododendrons introduced from China and Burma during the last thirty years is so great, amounting to several hundred distinct species of very different form and habit, that the amateur aiming at the formation of a moderate collection stands much in need of guidance in his choice. He will find exactly what he most wants in the compact and attractive volume before us. Mr. Cox is not only an experienced cultivator of this fascinating genus, but he has explored a region in which many of the most desirable species grow, has noted their behaviour in their native mountains and forests, and formed an estimate of those which are most suitable for the average conditions of British soil and climate. The average conditions, we say; for Mr. Cox is careful to explain that he has refrained from recommending such of the tenderer species as can be grown only in the mildest parts of our islands. On the other hand he points out that a low winter temperature is of positive advantage to such rhododendrons as are stimulated into precocious growth by unseasonable warmth in the dark days, only to have it destroyed by frost in April or May. That is very often the fate of such species as *R. oreodoxa* and its near ally *R. Davidi* in the mild west; whereas both these beautiful shrubs, when retarded by a cold inland winter, burst into abundant bloom when the trouble is past.

Howbeit it is not possible to lay down a hard and fast rule in this matter. The author explains that he has made no mention of *R. Aucklandi* (*Griffithianum*), "probably the finest rhododendron in the world, but it is not hardy except in Cornwall and a few very sheltered gardens in the south of England and Ireland." As a matter of fact, it thrives luxuriantly in suitably sheltered places along our western seaboard as far north as Ross-shire.

Again he says "I should advise no one, unless they live in the west, to grow *R. arboreum*, for it is not really hardy." This may serve as a general rule, but there are exceptions. At Preston Hall, near Dalkeith, there is a plantation of *R. arboreum* in perfect health extending to the best part of an acre on a sheltered hillside, the plants averaging over 20 feet high and probably 60 years old.

Very timely is Mr. Cox's counsel about the treatment of rhododendrons after they are planted.

"If," says he, "you are satisfied with a certain amount of flower on straggly, undersized plants, then they may be left alone; but if you wish your plants to possess that indefinable look of well-being that goes with a plant at the height of condition, constant feeding is absolutely necessary. . . . I cannot emphasize this point too much, for a great deal of that look of ill-health is only caused by starvation."

Of course the amount and quality of feeding required varies according to the nature of the staple soil. Where the soil is free and cool and the atmosphere humid, as it is on the west coast and in most parts of Ireland, nothing is required but a thick mulch of withered leaves to protect the roots from the effect of evaporation. A layer of freshly withered leaves laid on a foot thick in autumn will have sunk to a thickness of two or three inches by the following spring and soon decompose, forming the true forest soil which is all a rhododendron asks for, and which is indispensable for all the large-leaved species. Some growers apply farmyard manure; but that seems to us superfluous, even undesirable, except on a very dry, hungry soil.

The chapter on Azaleas is particularly useful, for this is a class of rhododendron that has been wrought into so many garden varieties that most amateurs will feel grateful for expert guidance in making a choice. "They are wonderful plants," says the author; "but my advice is to purchase only after seeing them in a nursery or at a flower show." We are surprised that Mr. Cox has found that *R. Vaseyi* "will not grow in full sun," for we remember seeing it in fine flower on a sunny slope in the Arnold Arboretum. Very useful, too, are the lists given at the end of the volume, one giving the species of rhododendron—large, smaller and dwarf—recommended by the author; another enumerating the most desirable hybrids, among which *R. kewense* ought surely to have been included. In a third list the names of the principal nurserymen who deal in rhododendrons are given, to which the venerable firm of Cunningham & Fraser, Comely Bank, Edinburgh, deserves to be added, were it only as the raisers of Cunningham's Sulphur and Cunningham's White.

A trifling misprint should be set right in a future edition, namely *Rhododendron eximium* instead of *eximeum* (p. 58 and index). The illustrations throughout are excellent, and altogether this handy little volume is exceptionally good value for the modest price of five shillings.

"The Principles of Agriculture." By J. R. Ainsworth-Davis. 8vo. xiv + 261 pp. (Methuen, London, 1924.) 7s. net.

Elementary botany, elementary geology, and elementary zoology form the three parts of this book. Naturally in so small a compass no completeness of treatment can be achieved, and the bearing of these "Principles" is only cursorily touched upon. Probably the great number of technical terms introduced (in leaded type very often) would tend to discourage beginners.

"The Warley Garden." By Miss E. Willmott, F.L.S., V.M.H. 40 folio plates. Ed. 2. (Wheldon & Wesley, London, 1924.) 10s. 6d. net.

This is a reprint of the first edition with a slight change in the binding.

"All about the Rose in Simple Language." By Sir J. L. Cotter, Bt. 8vo. 214 pp. (Melrose, London, 1924.) 6s. net.

This is a nicely got up little book, well and clearly printed.

The parts of the book dealing with the routine of culture of the rose are simply and for the most part correctly stated, and give the beginner in rose growing all the information he can usually acquire from a book. Other parts of the book are open to much criticism. The history of the rose is dismissed in three pages, nearly two of which relate to the period before the Christian era. Then we find a chapter on the different types of roses arranged alphabetically, but it somewhat detracts from the value of this arrangement that sometimes the Latin name is chosen for the heading and sometimes the English equivalent. It is difficult to find a principle on which this selection has been made. *R. alpina*, *alpina pyrenaica*, and the Boussaults (*alpina* hybrids) are each given a separate heading, but no place is found for such forms as *R. Hugonis*, *Moyesii*, *sericea*, or *rubrifolia*, which are nowadays more widely cultivated than many of the types selected. The Ayrshire rose is described as a native of Britain, which is misleading. These roses are supposed to be hybrids of *R. arvensis*, with some variety of *R. indica*, and in one sense the statement may be correct inasmuch as they were nearly all raised by British gardeners, just as 'Mabel Morse' might be described as a native of Ireland because it was raised by Mr. McGredy; but most people would read the word native as meaning indigenous or found growing wild there, in which sense the statement would not be accurate.

In the selections of varieties for various purposes little description is given except the colour and the class to which the rose belongs. The selection of roses for exhibition is to a large extent obsolete. It includes 19 H.P.'s, not more than 5 of which are now commonly shown—'Anna Olivier' is incorrectly described as an H.T. in this list and again in the list of pot roses, though it is correctly given as a Tea rose on p. 177. It is certainly not an exhibition rose. 'Bridesmaid,' again, which is a Tea rose, is incorrectly described as H.T., and though hardly at all grown out of doors in this country is recommended for exhibition. No mention is made in the exhibition list of such well-known show varieties as 'George Dickson,' 'Mrs. Charles Lamplough,' 'Mrs. George Marriott,' 'H. V. Machin' or 'Gorgeous,' but the list contains half a dozen Pernet roses, one only of which could be shown in a box. The others, which include a single rose, might be shown in the decorative classes, but the list contains no other decorative roses, and no suggestion of this is given. The list of roses to be grown in pots is also open to a good deal of criticism.

At the end of his chapter on hybridization the author gives the parentage of three roses, 'Frau Karl Druschki,' 'Mrs. Campbell Hall' and 'Mme. Abel Chatenay.' That given for 'Mrs. C. Hall' seems to be correct, but the parentage given for the others is not that usually accepted, though the author gives no hint of this. That of 'Frau Karl Druschki' is usually given as 'Merveille de Lyons' x 'Caroline Testout' (see R.H.S. JOURNAL, vol. 33, p. 173) and that of 'Mme. A. Chatenay' as 'Dr. Grill' x 'Victor Verdier.' The author, however, gives for the first 'Lord Bacon' x 'Gruss an Teplitz,' and for the last 'Antoine Rivoire' x 'Souvenir de Victor Hugo,' and one would like to know his authority for the change.

There are some plates of coloured illustrations of roses. These are in most cases not very satisfactory and do not give a good idea of the true colour of the roses intended to be represented.

"The American Rose Annuals." 8vo. 1923 192 pp., and 1924 200 pp. (American Rose Society, Harrisburg, Pa., U.S.A.).

These volumes contain, as did their predecessors, numerous short articles on roses and matters connected therewith, from which much interesting if disconnected items may be collected.

The rose is world-wide and so are the difficulties met with in its culture, which vary little in character whether in England or America.

The advent of the motor has decreased the domestic supply of manure both here and in America, but over there they do nothing by halves, and we read that one of the largest producers of cut roses maintains a considerable herd of cattle primarily to secure that scarce fertilizer, cow-manure.

The 1924 Annual contains two special features: one is the winter protection of roses, which in the colder parts of America is a more serious matter than with us and is dealt with by several writers. A covering of wax on the stems, which is recommended in one of these articles specially as a protection against excessive desiccation by dry winds at times when moisture cannot be taken from frozen soil, seems a novel form of protection of which one would like to hear further.

The other feature is shown in articles on rose growing in other countries than America. These embrace, beside the continent of Europe, China, Japan and Australia, the latter being dealt with in four short articles.

An attempt is being made towards the standardization of rose names, to which we may wish success, and the Editor, Mr. McFarland, contributes an article describing what has been done and the difficulties met with in the attempt.

The English rose-grower will find many points of interest in these volumes.

"Grassland Farming: Pastures and Leys." By W. J. Malden. La. 8vo. xxiv + 314 pp. (Benn, London, 1924.) 30s. net.

This book is not intended to deal with grass horticulturally but from the point of view of farming. Repetition adds to the bulk and cost unnecessarily, and but for that the book is one to be highly commended. Recipes for mixtures, descriptions of grasses, and methods of seeding, treatment and harvesting are all well dealt with.

"Elementary Chemistry of Agriculture." By S. Allinson Woodhead, M.Sc., F.I.C. 188 pp. (Macmillan & Co.) Price 3s. 6d.

The object of Mr. Woodhead's book is to introduce students to the chief fundamental facts of elementary science, or revise their knowledge of it. Those who propose taking up a more advanced study of agricultural or horticultural chemistry will find it very helpful. There are many useful tables of analyses and the text is clearly and attractively written. An unusual feature is a brief but well-written chapter on the beginnings of a chemistry of agriculture, with portraits. It would be well if the historical side were referred to more frequently in agricultural and horticultural textbooks.

On p. 16 a soil after ignition is described as a greyish-white ash, whereas normal soils in that condition are usually coloured red from the presence of ferric oxide.

The statement on p. 56 that soils darkened by means of a top dressing of soot cause the temperature to rise during the day and fall quickly in the evening does not coincide with the generally accepted view that dark-coloured soils attain the highest temperature because they absorb the most and radiate the fewest rays.

Well-chosen experiments at the beginning and useful questions at the conclusion of each chapter add to the value of this excellent publication.

"Vocational Chemistry." By John J. Willaman, Ph.D. 294 pp. (J. P. Lippincott Company, Philadelphia and London.) Price 8s. 6d.

The title of Mr. Willaman's book betrays its nationality. It is compiled for mixed classes at American Agricultural High Schools and contains words that are not common in England. Our expression, "the chemical composition" of plants, for example, is surely preferable to "the chemical make-up" of plants. Though designed primarily for American conditions it can to a certain extent be utilized by English students as well. The practical exercises and questions at the end of each chapter are good. Many subjects not even indirectly bearing on agriculture or horticulture, such as the manufacture of matches and fire extinguishers, of ink, and so on, are included and discussed rather too comprehensively. In the hands of competent instructors, however, who know what to omit, it should prove a useful guide for a year's course in elementary chemistry. In the chapter on organic chemistry complicated formulæ are employed without adequate explanation, and the statement that galactose is one of the constituents of milk sugar is hardly satisfactory and would be misunderstood. One rather misses all mention of ions and ionization, without which the definition of an acid, for example, and the explanation of the absorption of food by plants from solution

is not easy. Nor is there any mention of colloids and their influence on the water-holding capacity of clay and humus, which, by the way, is defined as a gummy, sticky material. The last six chapters are of no interest to horticultural students, since they deal, among other subjects, with animal nutrition, the chemistry of cooking and cleaning, and milk and its products.

"Manuring of Grassland for Hay." By Dr. W. E. Brenchley. viii + 146 pp. 8vo. (Longmans, London, 1924.) 12s. 6d. net.

One of the "Rothamsted Monographs on Agricultural Science," this book naturally deals with the long-continued experiments on grass commenced in 1856 by the late Sir John Lawes.

The book includes a tremendous amount of detail regarding the effect of various manures upon the different species of plants comprised within a meadow. So great is the detail that it almost swamps the conclusions, but from the particulars given the student can determine the effect of different manures on the composition of the herbage in the particular circumstances at Rothamsted.

"The Cultivation of New Zealand Plants." By Dr. L. Cockayne. 8vo. 139 pp. (Whitcombe & Tombs, Ltd., Christchurch, N.Z., and London, 1924.) 4s. 6d.

Dr. Cockayne, who is one of the greatest living authorities on New Zealand plants, has done a great service in writing this handbook, which has for its object the popularizing of native plants.

He gives a list of those plants most suitable to cultivate; method of cultivation; native habitats, etc.

The illustrations are good, and the book is full of useful and interesting information put in a concise form. The book should commend itself to all lovers of New Zealand plants, not only in New Zealand but also in the British Isles, where many New Zealand plants are now being grown.

"Rice." By E. B. Copeland, Professor of Plant Physiology and Dean of the College of Agriculture, retired, University of the Philippines. (London: Macmillan & Co., Ltd. 1924.) Pp. xiv + 352. Price 20s. net.

The author claims that this book is the first in a Western language to deal with rice, although an extensive but scattered literature exists on many aspects of the subject. The book opens with an account of the botany of the rice plant, and discusses its requirements as regards climate, soil, and water. The last-named element is of the greatest importance, for, unlike other cultivated cereals, rice requires standing water in which to grow; and in countries where the natural rainfall is insufficient water has to be supplied by artificial means. In common with most cultivated plants rice suffers from the attacks of a number of diseases and pests, and these and methods of control are described; but none of the ills to which it is liable is so detrimental to its well-being as lack of water. Some thousands of different varieties of rice are known to exist in cultivation, some of them being only of local importance, but the choice of suitable seed presents one of the rice-grower's greatest problems, for on this largely depends what his ultimate crop is to be. In the chapter on seed and varieties of rice the author describes many different classes into which the varieties are grouped, and points out the need for more accurate descriptions of local varieties than at present are available. To aid in obtaining uniformity of method in describing rice varieties, he gives an "outline of description," which, if used by future writers, would do much to bring about a more accurate knowledge of the many rice varieties that exist in various parts of the world, and would aid the breeder in obtaining suitable kinds for acclimatization, cross-breeding and selection. Although rice is considered as a world crop, the author deals in greatest detail with the methods of cultivation as carried on in the United States and in the Philippine Islands, these being the two rice-growing countries with which he is best acquainted. In the Philippines the methods adapted are typical of those employed in Oriental countries; these involve elaborate terracing of hillsides to enable the necessary water to be held or run off as required, and much of the work of cultivation is hand labour. The methods employed in the United States, on the other hand, illustrate the use of machinery and modern labour-saving devices which reduce hand labour to the smallest possible amount. Italy and Spain are the only two European countries that have a rice-growing industry. It is in Oriental countries, where rice is the principal food-stuff, that the greatest areas under this crop are found, and from whence the chief commercial supplies are obtained.

Rice is believed to be the world's greatest crop, and it is fitting, therefore, that it should be studied scientifically with a view to its improvement, for every advance in this direction means benefit to masses of the world's human population, who find in rice their "daily bread." On these grounds Professor Copeland's book is to be welcomed, and it is to be hoped that it will stimulate and facilitate the study of rice and improve its cultivation.

"Botany: a Junior Book for Schools." By R. H. Yapp, M.A. 8vo. 199 pp. (Cambridge University Press, 1923.) 3s. 6d.

This little textbook is lucid, concise, and interesting. The hints for practical work at the end of the chapters are excellent, and if carefully followed out would ensure accuracy of observation and method.

The 159 figures in the text are from original drawings made from actual specimens, and could not be bettered as models for students to imitate.

"Rock Gardening in New Zealand." By D. Tannock. 8vo. 94 pp. (Whitcomb & Tombs, Auckland, etc., N.Z., and London [1924 ?].) 4s.

A small handbook with seventeen photographic illustrations. It is good to see that rock gardening is finding favour in New Zealand, but the chief interest to British gardeners is found in the last chapters, on native plants of New Zealand.

"Extinct Plants and Problems of Evolution." By Dukinfield H. Scott, F.R.S. 8vo. 240 pp. (Macmillan, London, 1924.) 10s. 6d. net.

A masterly review of our present knowledge of fossil plants. The author starts with the present-day flora and traces the succession of various types backward to the earliest known beginnings of a land-vegetation.

In so doing the relations of one to another are carefully examined for evidence of a gradual chain of evolution.

The conclusion is reached that "we know a good deal about extinct plants, but not enough as yet to throw much light on the problems of their evolution." However, the Rhynie fossils are admitted to support the view that vascular plants were derived from Algae.

The evidence is regarded as insufficient to support a monophyletic theory, and the Lycopods, Articulatae, Ferns, and Seed-plants appear to be distinct lines of descent though they may have originated from a common initial group.

The Cycadophyta probably descended from the Pteridosperms, and Conifers from the Cordaitales, and on the whole the evidence is favourable to the "conception of an orderly and gradual evolution without sudden and inexplicable leaps."

Though out of the line of the ordinary garden lover, this book is so clearly written and well illustrated that it is worthy of study by all who are interested in evidences of evolution.

"The Biology of Flowering Plants." By Macgregor Skene, D.Sc. 8vo. 523 pp. (Sidgwick & Jackson, London, 1924.) 16s. net.

The preface states:

"This book is an attempt to give an account of the way in which the flowering plant lives, especially in relation to its environment. This, it might be said, is the aim of *ecology*; but ecology approaches the plant as a member of a community, while *biology*, as it is understood here, is interested rather in the plant as an individual."

The result is a marvellously complete but concise store of facts regarding the physiology, structure, and habits of the main forms of flowering plants. They are presented in a clear, simple, and interesting manner, with abundant references to the experiments and observations of recent workers on which the statements are based.

The seventy-six illustrations are excellent, and the whole work forms a valuable, up-to-date textbook for students or those who care for more than the outward beauty of the plants they meet with. *Strelitzia regina* for *reginae*, omission of the first *e* in *Freycinetia*, and transposition of *i* and *e* in *Tolmiea*, both in text and index, are slips requiring alteration in a future edition.

"Flowers: a Garden Notebook." By Sir Herbert Maxwell. 4to. 250 pp. (Maclehose, Jackson & Co., Glasgow, 1923.) 25s. net; éd. de luxe, £3 3s.

This beautifully printed book contains pleasant reading and a store of ripe experience in every sentence. There is a singular charm in the dignified prose

that nevertheless flows so easily that it is also remarkable for an almost homely simplicity.

A keen sense of the beautiful has assisted the author in acquiring recollections of what is best in his own and other gardens, as well as from many books and interesting friends.

So we read: "There was a time when the late Lord Avebury and I used to escape from the House of Commons . . . for a ramble in the Kentish marshes or elsewhere. I never returned from one of those excursions without some fresh bit of knowledge, and it was on one such occasion that he showed me how the carpels of meadow-sweet are twisted into a spiral; whence the name *Spiraea* for the whole genus."

There are twelve coloured plates reproduced from original drawings by the talented author. All who have seen the beautiful originals must regret that, with the exception of *Rhododendron Souliei* and *Alstroemeria Hookeri*, they have had to be so much reduced. Still all are good, and those of *Lilium regale* and *Eucryphia pinnatifolia* are remarkably so.

A few mistakes have escaped the proof-reading: ordeal. *Paeonia Cambessedesi* should follow the name of the traveller *Jaques Cambessedes*, who wrote a flora of the Balearic Isles, and become *Cambessedesii*. The English Iris is *I. Xiphoides*, not *I. Xiphium*, as stated.

Among other bulbous plants the Snowdrop entirely renews its bulb of three overlapping rings every season, and is an exception to the statement that bulbs live for an indefinite number of years.

Mr. Mangles is quoted as stating that normally white-flowered plants do not sport to coloured varieties. The Common May, Wood Anemone, and Daisy prove the contrary.

The Climbing Dahlia, *Hidalgoa Wercklii*, has been overlooked as a rival climbing composite to *Mutisia*. But what matters a few slips among so large a mass of accurate facts? This Garden Notebook is one of the most instructive and inspiring of Sir Herbert Maxwell's many valuable and delightful works.

"The Cultivated Evergreens: A Handbook of the Coniferous and most important Broad-leaved Evergreens planted for ornament in the United States and Canada." Edited by L. H. Bailey. Large 8vo. (Macmillan, London, 1923.) 31s. 6d. net.

After a period of nearly a quarter of a century, during which no general handbook on conifers appeared in English, two comprehensive works dealing with this important group of plants have been published almost simultaneously. The book now before us, the latest produced by Prof. L. H. Bailey and his collaborators, and following closely on the "Manual of Cultivated Plants," has a somewhat misleading title, for it discusses very few broad-leaved evergreens, while on the other hand, accounts of several deciduous conifers, such as the larches and the deciduous cypress, are included.

The first part of the book, occupying 166 pages, is taken up with a general sketch of the conifers in cultivation, and includes contributions by well-known authorities on Evergreens in the Landscape, Cultivation and Propagation, Adaptation of Conifers, Insects, Diseases and Injuries, and contains much useful matter.

Information of interest to the general reader is given under the heading of "The Christmas Tree Problem." In England the Norway spruce is almost the only conifer used for this purpose, but in America there is a much wider choice, balsam and other firs, pines, the Lawson cypress, the red cedar, and even hemlocks, all finding favour according to custom and local availability.

The second part of the book, for which the well-known authority, Mr. Alfred Rehder, is responsible, contains a systematic enumeration of the conifers, evergreen and deciduous, cultivated in North America, and follows much on the lines of Messrs. Dallimore and Jackson's recent handbook. This part of the work is, on the whole, well done. There are elaborate keys both to genera and species, which will be a help towards identification. We notice, however, that the diagnostic characters in the key do not always agree with the descriptions in the body of the work, which is somewhat disconcerting. Thus in the key to *Abies* (p. 249) we are told that the buds of *A. Faxoniana* are slightly resinous, and later, at p. 253, that they are very resinous. Again, in the key to *Pinus*, the Chinese species, *P. Armandi*, is placed in the section having leaves 3 to 5 ins. long, while elsewhere it is said to have leaves 6 ins. long. Under *Picea* no fewer than thirty-eight "species" are described or mentioned, eighteen of these being from Central and Western China, but recent research has shown

that a large proportion of these do not exist outside their book descriptions. In this country plants raised from seed received from native localities in China, under the names of *P. Sargentiana*, *P. complanata*, *P. adscendens*, and *P. brachytyla*, have all turned out to be forms of one species, and it is evident that other so-called species from the same region will have to be similarly treated. A slavish adherence to the Vienna rules accounts for the use of many names unfamiliar to gardeners and foresters, but it is doubtful if many of these will ever be adopted in general practice. Such combinations as *Picea Abies* for the European spruce, *Abies alba* for the silver fir, and *Larix Kaempferi* for the Japanese larch, are quite certain to be ignored on this side of the water. The foliage of several conifers has a distinctive odour when rubbed and affords a useful means of identification in the field. The Douglas fir, *Cupressus nootkatensis* and *Thuja plicata* are examples of those which may be "spotted" by their smell alone, but except in the case of *Picea alba* these points are not mentioned.

The section devoted to broad-leaved evergreens occupies less than 40 pages of the whole book, but it must be remembered that the number of broad-leaved evergreens which attain tree-like proportions in northern latitudes is very limited. There is much useful general advice on the treatment of rhododendrons and their soil requirements. It is somewhat surprising to find such well-known things as *Magnolia grandiflora* and *Arbutus Menziesii* omitted from a chapter on broad-leaved evergreens.

There is a useful check list of woody evergreens at the end of the book.

The numerous photographs and drawings add considerably to the attractiveness of this handsome volume, but the unnecessarily wide margins make the book somewhat cumbersome to handle.

"Shrubs for Amateurs." By W. J. Bean, V.M.H. Demy 8vo. Illustrated. viii + 117 pp. ("Country Life" Library.) 5s. net.

Lovers of gardens and readers of gardening books are alike indebted to Mr. Bean for the splendid work he has done in popularizing the cultivation of trees and shrubs in our gardens. His great work, "Trees and Shrubs Hardy in the British Isles," which was published ten years ago by John Murray, is the standard book on this subject, and all horticulturists are looking eagerly for the appearance of the third volume, the matter for which is, we believe, in a forward condition, and which will, when published, bring this work up to date. In the meantime, "Country Life," Ltd., has issued this smaller work by the same author, which should find a warm welcome among amateur gardeners throughout the British Isles. The volume before us is of handy size, well printed, and the fifteen photographic illustrations are good and well chosen as regards their representative character. The chapters are conveniently arranged and deal with the different subjects in the following order: cultivation, transplanting, arrangement, pruning, propagation, select list of shrubs, and finally a descriptive list of shrubs which occupies some 87 pages and deals with three or four hundred species and varieties. Each chapter contains explicit and useful information, but the select lists of shrubs will be specially helpful to those who have but a limited space available in which to grow them, whilst the tables dividing them into the flowering periods will be useful to others who desire to have their gardens gay and interesting at particular seasons of the year. The final section is arranged alphabetically, and, besides giving accurate descriptions in popular language, contains valuable cultural and geographical notes on each plant. These add much to the interest and general usefulness of this attractive and up-to-date little volume.

"My Garden Book." By John Weathers. La. 8vo. 774 pp. (Longmans, Green & Co., London, 1924.) 36s. net.

Mr. John Weathers is an experienced writer of compendious books upon horticulture, and "My Garden Book" is his latest and most ambitious work. It is divided into parts, e.g. garden-making, hardy flowers, glass houses, fruit, and vegetables; of these the first contains the greatest amount of interesting matter, and this portion (145 of the 774 pages) is sufficient to justify the publication of what is really a valuable introduction to gardening, based upon sound knowledge, the result of practical experience. It is calculated to arouse new and attractive interests in the minds of most of its readers, as it contains features that have hitherto been too commonly omitted, such as the composition and improvement of the soil, the functions of roots and leaves, propagation, and gives the derivation or origin of generic plant names. This last feature may seem a dull

matter when thus baldly stated, but beginners will be astonished to find how much such information will add to their interest in plants, and how greatly it will assist them to remember the "Latin" names of which so much complaint is commonly heard.

"My Garden Book" can also be heartily recommended to beginners as a basis of much and varied information on plants, but it may be well to give a warning that such a book should not be regarded as "the last word" on any of its vast sphere, and should rather be looked upon as a useful introduction to, and a preparation for, the better use of other books that, without such information as Mr. Weathers supplies, may seem too advanced or too technical. The portion devoted to ornamental and flowering trees and shrubs is extraordinarily scanty, and, having regard to their importance and rapidly growing popularity, this must be regarded as the least satisfactory portion of the book. The book is intended for beginners, and clearly the selection of the trees and shrubs, since their maturity is necessarily long delayed, should be urged as a primary duty, and the information given should be as complete and as accurate as space will allow. But, to be critical, Mr. Weathers seems to be less at home with this section of his subject than with the flowers and bulbs that have previously occupied the services of his pen, and of which here he writes admirably and at length. The book is handsomely got up, the type is clear and conveniently large, and it is profusely and expensively illustrated with coloured plates, photographs, and drawings. Of these much might be written, as it is true to say that from a study of them might be learnt both how and also how not to illustrate a book of valuable horticultural interest. The 24 coloured plates vary greatly in value and interest; there are instructive and beautiful pictures (by G. S. Elgood, R.I.) of Levens, Blyborough, and Stonehall, others that are only fairly good portraits of quite familiar plants and, least satisfactory of all, some which are merely meaningless masses of colour, the merits of which should have no place in a serious book.

The reproductions of photographs are for the most part excellent, but those of drawings the most valuable of all, whether of sprays of living plants or of a purely educational character. Some of the above remarks may sound hypercritical, but it is hoped that enough praise has been rendered to assure readers that Mr. Weathers has produced a book for which it is expected that many will rightly be grateful, and it is certainly packed with most helpful information. There is an excellent index.

"*Icones Fungorum Malayensium*." Edited by Dr. C. von Overeem and Prof. Dr. J. Weese. (Martinus Nijhoff, The Hague, 1924.) Parts 1 to 4, at 1.50 guilders per part.

The publisher states that the object of the present work, of which 4 parts have appeared, is "to bring the rich fauna [*sic*] of the fungi of the Dutch East India Archipelago within the reach of the Botanist and the Agriculturist." The preface is signed by both editors at Buitenzorg (Java) and Vienna, May 1923. Each part consists of one coloured plate together with descriptions in German. Twelve parts are to appear each year.

The first four parts deal with various species of the Clavariaceae, each of which is well and fully illustrated.

Neither the distribution nor the synonymy of any species is given, and as some of those described—e.g. *Clavaria fusiformis* Fries, *C. vermicularis* Fries—are common British species this omission is likely to detract from the general usefulness of what otherwise appears to be an excellent work.

"Bulbs and Tubers used in Medicine and Commerce: with the Mention of other Portions of the Plants also of Economic Value." By Mrs. M. Grieve. 8vo. vi + 118 pp. (Grieve, Chalfont St. Peter, 1924.) Paper covers, 2s. 6d.

There is a great amount of information packed within the pages of this little book, and a perusal of it will show what a large number of plants are (or have been) used in medicine. It would be more valuable still if more care had been exercised in correcting it before publication. *Muscari comosum* is not American, for example, nor does *Crocus* belong to the Liliaceae; the Snowflake is not *Lencojum*, and of *Leucojum*, *vernus* and *aestivum* are not varieties but species, and these are not the only two species, as we are led to infer. By *Ornithogalum thyroides* is probably meant *O. thyrsoides*, and by Pennsylvania, the State of Pennsylvania is probably indicated. Such errors matter little to the informed but to the beginner they may matter much.

"A Text-book of General Botany." By G. M. Smith, J. B. Overton, E. M. Gilbert, R. H. Denniston, G. S. Bryan, C. E. Allan. 8vo. x + 409 pp. (Macmillan, New York, 1924.) 16s. net.

The particular part each of the authors mentioned has played in the production of this book is not evident, but a very useful text-book has been produced. A good many of its illustrations have naturally been drawn from American sources, but it would, nevertheless, make a good text-book for English students of botany.

"Cut Flowers for Market." By F. J. Fletcher. 8vo. 64 pp. (Benn, London, 1924.) Paper covers, 2s. 6d. net.

Brief notes and cultural directions concerning plants commonly grown for sale as cut flowers.

"Gardens of South Africa." By Dorothea Fairbridge. (A. & C. Black, London.) 10s. 6d. net.

This book is excellent for those whose good luck sends them to make gardens in the African sunlight. It is also interesting to all who care to know what other gardeners do in other climes, and above all to those who care for plants for their own sakes. The chapters on the native plants make one long to wander among Babianias, Grazanias, Nemesias, Watsonias and Ixias that colour tracts of country or to rediscover the once seen albino *Disa grandiflora*, and a Nerine that is white and powdered with gold dust. The name Chinchinchee we are told was given to the two *Ornithogalums* now so freely imported into England in the bud state, from the sound made by the stems when they are rubbed together.

The description of a wild flower show in Chapter XVII is delightful. Most of the sixteen illustrations are crude and hard. One of tubs of Hydrangeas standing on the tiled floor of a stoep is far and away better than the others.

The final chapters with good advice for the beginner are full of useful knowledge resulting from experience. Were it not for winds and storms, ants and a bulb-devouring mole, S. Africa appears to be the gardener's paradise. The use of capitals for specific names is irregular, and we find *Euphorbia dregeana* and *Clematis stanleyi*, but *Aloe Plicatilis* and *Mitrasiformes*. As a whole though, the names are correct, save for a batch of Ericas on p. 114, the usual mistake of *Dierama pulcherrima* for *um* and other printers' errors that have escaped the eye of the proof-reader.

"Hardy Bulbs for Amateurs." By the Rev. Joseph Jacob. ("Country Life" Library, 1924.) 5s. net.

Few books that contain so much useful and practical knowledge are written in such a gay and gossipy style. Its author writes of plants he knows and likes well, and will certainly gain them all many new friends and admirers. Further, his frequent excursions from the plants to their associations, history or nomenclature should open the eyes of many a novice to the immense stores of interest attaching to most of our garden favourites apart from their beauty or fragrance. As might be expected from one who has written so much, including two handbooks, on Tulips and Daffodils, these two popular flowers find preferential treatment and fill the longest chapters. That on Tulips contains the study and experience of many years so cleverly condensed under headings that it is a complete handbook of the flower in tabloid form. Such little-grown bulbs as Camassias, Brodiaeas and Alliums are also dealt with, and the most suitable forms of each are recommended for trial. The term bulb is used in its widest sense to include corms and tubers, so Cyclamen, Crocus, Colchicum, Eranthis and Ranunculus have short chapters devoted to them. The fifteen plates are excellently reproduced photographs of growing plants. Better proof-reading should have prevented the use of rhizotomous for rhizomatous irises, and the spelling of Xiphion with a Z, besides certain minor irregularities among specific names, but on the whole the book is carefully planned and well printed and makes pleasant and interesting reading.

"Marvels of Plant Life." By E. F. Daglish, F.Z.S. viii + 261 pp. 8vo. (Thornton Butterworth, London, 1924.) 6s. net.

This is an account of some of the more noticeable phenomena—sleep movements, contact responses, pollination, seed dispersal, insect traps—of plant life, well written and well illustrated. For those who do not know and possess

Kerner's "Natural History of Plants," this readable little account will be a source of pleasure, and will doubtless excite feelings of respect for organisms that in the main fight the battle of life passively but none the less with success, and sometimes by aggression, paradoxical as passive aggression may seem.

"The Flower Lover's Guide to the Gardens of Hampton Court." By E. Law. 8vo. 46 + 4 pp. (Bell, London, 1923.) 2s. net.

We noticed the first edition of this little book in a recent issue. This gives additional lists of plants used in spring bedding and of trees. The number of errors in names (not counting punctuation) is perhaps somewhat smaller than in the earlier part of the book—we counted only sixteen on the first additional page—and we are able to guess what nearly all of them are intended to indicate.

"The Atmosphere and its Story." By Ernest Frith, F.R.M.S. 8vo. 204 pp. (The Epworth Press, London, 1924.) 6s. net.

The science of meteorology has now become of great importance in connexion with aviation, and the daily broadcasting of detailed weather reports has made these matters of great interest to a much wider public than hitherto. This very readable book, which is described as "a popular presentation of the science of meteorology, free from technicalities and formulæ," will be very welcome to those who desire to learn more of this fascinating subject. It consists of thirty-one chapters, and its very clear and interesting explanations of the various phenomena should be of great assistance to teachers and lecturers, as well as being acceptable to the general reader. The author has written with a good deal of South African bias in the matter of examples, but the book is none the less valuable on that account, for the principles involved are the same all over the world. There are particularly interesting chapters on "Clouds and Fogs," "Why it Rains," "Hailstorms and Hailstones," "On the nature of Dew," "Atmospheric Pressure," "Precautions during Thunderstorms," "Curiosities of Lightning," and "Lightning Conductors." Among the illustrations the photographs of clouds are good, and helpful in identifying the various types. The coloured frontispiece entitled "A Noontday Sky in Summer" is merely ornamental. The type is clear and easy to read. There is no index, but the list of chapter contents makes reference to any particular point fairly easy.

"Icones Plantarum Japonicarum, or Coloured Figures and Descriptions of Plants indigenous to or cultivated in Japan, including the Bonin Islands, the Luchu Islands, Formosa, Korea, the Kurile Islands and Southern Saghalien." By Tokutaro Ito, Sc.D., F.L.S. Part 6. March 1924. Folio. (Dobunkwan Co., Tokyo, 1924.) Yen 3.60.

The first five parts (which are out of print) of this fine publication were issued some years ago, and now the publication is resumed with Part 6. It is intended to publish four parts a year, and if this be an example each part will contain four coloured plates of native Japanese plants with descriptive letterpress in Japanese and English in parallel columns. The plates depict the following plants life size: *Sanicula rubrifolia*, *Primula Sieboldii*, *Saxifraga sarmentosa*, *Lychnis coronata*. Each is printed in colours, and gives a faithful representation of the plant and numerous analytical details (also coloured). The text gives the name and Japanese names, a map showing the world-distribution of the plant, the generic and specific characters (in English), exhaustive references and synonymy and lists of plates, a description of its habitat, and any notes available upon its cultivation. The whole (with the exception of trifling typographical errors) is very well done.

NOTES AND ABSTRACTS.

[For Index of Periodicals quoted see previous volumes.]

Acidity of Plant Juices. By F. G. Gustafson (*Amer. Jour. Botany*, vol. xi. No. 6, June 1924, pp. 365-369; 6 figs.).—This paper is an attempt to discover whether there is any correlation between total acidity and H-ion concentration in plant juices. *Zea Mais*, *Cucurbita maxima*, *Helianthus* sp., and *Bryophyllum calycinum* were used, and it was found that the total acid of these plant juices does not account for the H-ion concentration gradient found in these plants. There is no constant relationship between total and actual acidity. The juices from young plants require more NaOH to neutralize than the juices from the older parts of the same plants, even when the former is nearer to the neutral point at the beginning than the latter.—A. B.

Aeschynanthus sikkimensis Stapf (*Bot. Mag.* t. 8938; Oct. 1922).—An epiphyte related to *A. maculatus*, of which it was originally regarded as a variety, but more robust, with wider entire leaves and glabrous pedicels. It is a greenhouse plant, the *Odontoglossum* house suiting it; native near Darjeeling, where Mr. Elwes collected it.—F. J. C.

Ammoniacal Nitrogen in Soils, A New Method for the Determination of. By W. McLean and G. W. Robinson (*Jour. Agr. Sc.*, vol. xiv. pt. 4, pp. 548-554).—A method for the determination of ammoniacal nitrogen in soils is described. It is an extension of the Hissink method for exchangeable bases to ammonium present in the soil, and has the advantage over the aeration method that it does not require expensive apparatus and may be employed where a high-pressure water supply is not available. It is fairly rapid. The close agreement of the results obtained by the new method and those obtained by the aeration method suggests that the amount of ammoniacal nitrogen in the soil at any given time is not an arbitrary quantity depending on conditions of estimation, but a definite amount. It is considered improbable that any ammonium compounds exist in the soil apart from those which take part in the base exchange.—A. S.

Amorphophallus cirrifer Stapf (*Bot. Mag.* t. 9000; March 1924).—A curious aroid from Bangkok requiring warm-house treatment and having when in flower an offensive odour.—F. J. C.

Amorphophallus coffeatus Stapf (*Bot. Mag.* t. 8950; Feb. 1923).—Native of S. Rhodesia. Bears a coffee-coloured spathe before the leaves. Requires warm-house treatment.—F. J. C.

Amorphophallus titanum. By P. Dakkus (*Gard. Chron.*, Nov. 1, 1924, pp. 302-4; 4 figs.).—Remarkable photographs of this huge aroid and interesting facts concerning its flowering and the temperature inside the spathe.—E. A. B.

Antirrhinum, Notes on some Diseases of. By W. Buddin and S. M. Wakefield (*Gard. Chron.*, Aug. 30, 1924, pp. 150-152; 6 figs.).—Deals with stem rot and leaf spot due to *Phyllosticta Antirrhini* and leaf disease due to *Cercospora Antirrhini*. The former is only associated with greenhouse conditions; the latter has not yet been fully investigated. Leaf spot due to *Septoria Antirrhini* is also referred to.—E. A. B.

Apple Blossom Weevil, The Control of the. By A. M. Massee (*Jour. Pomology*, iv., No. 1, July 1924, pp. 24-37).—Investigations were carried out at East Malling from May 1921 to April 1924 as to the best control measures against *Anthonomus pomorum* L.

The results obtained were disappointing in the case of poultry, jarring and grease-banding and lime and arsenical washes, but the method of trapping by means of sacking bands was decidedly promising.

Hens, although of little value against *Anthonomus*, proved very useful in destroying leaf-eating weevils, e.g. *Phyllobius oblongus* L., results showing that only thirty-nine weevils were caught on grease-banded trees under which hens were kept, whilst 2,591 were caught on control trees.

Jarring, grease-banding, and spraying were of insufficient merit to warrant recommendation.

Five tables are given showing the results obtained by sack-band trapping over a series of three seasons.

The following recommendations are given: the bands should be in position by the end of May and left on until December or January, when they should be removed, placed in a bucket of water with a film of paraffin on the surface—the bands being weighted down by means of stones. The best position is to tie them as near the fork of the branches as possible, and trees grown on a very short leg would be much more difficult to band successfully. One tie round the middle of the band gives the best results as it allows entrance both above and below the tie.

Sacking should be cut into 6-inch wide strips placed twice round the trunks to allow a double thickness.

In spring large numbers of the clay-coloured weevil, *Otiorrhynchus picipes* F., were found in the bands, and this suggests a possible method of controlling this pest on newly-grafted stocks.—G. F. W.

Apple Blotch Cankers, Origin of, and Control. By Max. W. Gardner (*Jour. Agr. Research*, vol. xxv. No. 10, Sept. 1923, pp. 403-418; 3 plates).—Blotch cankers (*Phyllosticta solitaria* E. and E.) are usually found at the leaf scars and bases of the terminal bud scales. They become visible about April and May, and persist year after year on the margins of the canker. To eradicate the blotch cankers from young trees, pruning out the cankered branches in the spring-time is suggested. The sprays which prevent fruit infection also prevent canker formation on the stems. Bordeaux mixture 4-6-50 or 2-4-50 is suggested.

A. B.

Apple By-products. By G. P. Walton and G. L. Bidwell (*U.S. Dep. Agr., Bull.* 1166, pp. 1-39; 1 fig.).—As Apple pomace, the solid residue left in the cider press, soon ferments, it should either be placed in a silo and used as food for cattle and pigs, or the pectin may be extracted by hot water and used in the manufacture of jellies. The residue is then dried by steam heat in a revolving cylinder. The dried product undergoes no further change. When required for fodder it is steeped in water. The addition of molasses makes it more palatable.

S. E. W.

Apple, Internal Browning of the Yellow Newtown. By W. S. Ballard, J. R. Magness, and L. A. Hawkins (*U.S. Dep. of Agr., Bull.* 1104, Oct. 1922, pp. 1-24; 2 plates).—Certain varieties of apples when in cold storage develop a brown discoloration—"internal browning." Apples from Pajaro Valley, California, are much more susceptible than any other section, and this defect develops more quickly if fruit is kept at 32° F. than if kept at 36° or 40° F. Internal browning develops mainly in those orchards having high soil fertility, where humidity is high and with little sunshine. It varies widely in fruit from individual trees in a single year. Large apples with high sugar and acid contents and from branches girdled during the growing season tend to become browned to a greater extent than normal fruit from the same tree. The fruit from the Yellow Newtown apple should be stored at 36° F. to prevent this discoloration developing.—A. B.

Apple-Leaf Spot Disease (*Alternaria Mali* Roberts). By John W. Roberts (*Jour. Agri. Res.* vol. xxvii. No. 9, March 1924, pp. 699-708; 2 plates).—*Alternaria Mali* often enters apple leaves through injured or dead spots and forms characteristic crescent-shaped or circular enlargements. Some of the more important morphological characters of the genus *Alternaria* on apple, lilac, cranberry, blackberry and Forsythia are given. *A. Mali* is more fully described with detailed measurements of conidiophores and "septate" conidia. Variants due to mutation are also described.—A. B.

Apple Packing-Houses: North-Western. By R. R. Pailthorpe and H. W. Samson (*U.S. Dep. Agr., Farm. Bull.* 1204, June 1921; 22 figs.).—Deals with the details of construction, arrangement, equipment, and operation of boxed apple packing-houses.—V. G. J.

Apple Scald, Control of. By Chas. Brookes, J. S. Cooley, and D. F. Fisher (*Jour. Agr. Res.*, vol. xxvi. No. 11, Dec. 1923, pp. 513-536).—The results are reported on 67 different apple storage experiments carried out under commercial conditions. Apples packed in the usual unoled wrappers have had practically the same degree of scald as those that were unwrapped. Paraffin-waxed wrappers have caused considerable reduction in the prevalence of scald, but oiled wrappers have given better results. Seven different mineral oils have been tested in the oiled wrappers and all have proved to be efficient in scald control. Oiled blotter material scattered through the barrel has reduced apple scald to about one-third the amount found in the untreated barrels.—A. B.

Apple Stem Tumour, not Crown-gall. By Nellie A. Brown (*Jour. Agri. Res.*, vol. xxvii. No. 9, March 1924, pp. 695-698; 3 plates).—Some outgrowths on apple-stem hitherto believed to be due to infection by *Bacterium tumefaciens* (the organism causing crown-gall) are not secondary outgrowths from tumour strands, nor are they primary infections. No *B. tumefaciens* was found, and the author suggests that the tumours were caused by punctures from the woolly apple aphid (*Erisoma lanigera* Hausmann).—A. B.

Apple Tissue, Darkenings of. By E. L. Overholser and W. V. Cruess (*U.S. Exp. Stn., Cal.*, June 1923, Tech. Paper No. 7, pp. 1-40).—The oxidation products in the browning of apple tissue were thought to be a peroxidase and an organic peroxide; the first transfers to the compound to be oxidized the oxygen derived from the organic peroxide found in the fruit, and acts as an accelerator. Various reagents may be used to demonstrate the presence of the peroxidase in apple tissue or apple juice, and these include benzidine (1 per cent. aqueous solution) in presence of H_2O_2 ; dilute solutions of KI, starch, and CH_3COOH also proved satisfactory in determining qualitatively organic peroxide in apple tissue. The organic peroxide and peroxidase were separated from the tannin of apple juice by precipitation of the enzymes with 95 per cent. alcohol. The tannin of apples appears to belong to the catechol group. Treatment with nitrous ether gives uniform browning throughout the tissue, indicating an even distribution of the tannin. Apples stored in nitrogen for one month remained unaltered in appearance, and gave positive reactions for the peroxidase and organic peroxide. Apples stored in CO_2 , H_2 , or O_2 browned rapidly, and their tissues gave negative results for organic peroxide. Vapours of CS_2 , $HCHO$, CCl_4 , C_6H_6 , ether and ethyl alcohol were used for storage of apples with results similar to those for CO_2 , H_2 , or O_2 . From this it would appear that nitrogen may be used for the storage of fruit on a commercial scale.

A bibliography is appended.—A. B.

Apple, Yellow Newtown, Factors Influencing the Development of Browning in. By E. L. Overholser, A. J. Winkler, and H. E. Jacob (*U.S. Exp. Stn., Cal., Bull.* No. 370, Sept. 1923, pp. 1-40; 1 plate).—Internal browning is a non-parasitic disease of the tissue of the apple. The variety Yellow Newtown is particularly susceptible to this internal browning, and it occurs more frequently on fruits from old trees than on those from young trees. The later the fruits are picked the greater the amount of the browning in storage and the more rapidly it develops. No relation was found to exist between the amount of the browning and the sugar or acid content of the apples or the pH value of the expressed juice of the apples. A low temperature of about 5° F. greatly increased the susceptibility of the fruit to browning, while an increase of 10° F. in temperature markedly increased the resistance of the fruit to this disease. Browning is greatly decreased by ventilating the fruit, and this, with careful regulation of the temperatures and early harvesting, will control in some measure this disease.

A short bibliography is appended.—A. B.

Apples in Storage, Physiological Studies on. By J. R. Magness and H. C. Diehl (*Jour. Agr. Res.*, vol. xxvii. No. 1, Jan. 1924, pp. 1-38; 15 figs.).—Amongst the more important physical changes in apples during development and ripening are increases in size, changes in colour, in skin texture, and hardness of the flesh, and all these are intimately associated with storage quality in apples. The rates of these changes vary with the temperature. The rate of softening in apples varies also with the varieties. At freezing point (32° F.) Winesap and Rome Beauty soften as much in three to four months as in twelve days at 70° F.

All varieties showed a constant decrease in acidity during storage at 32° F. The rate was nearly the same for all varieties, regardless of original acid content.

Coating the surface of the fruit with paraffin or oil reduces the permeability of the skin, and this results in a higher concentration of CO_2 . Excess of the coating material causes anaerobic respiration in the fruit, and this is accompanied by the development of disagreeable flavours in the fruit.

Increasing the concentration of CO_2 in the atmosphere surrounding the apples results in a lower rate of softening of the fruit.

In normal, uncoated fruit, the respiratory ratio at all temperatures is approximately 1, indicating no anaerobic respiration in any of the normal fruit studied.

Concentrations of 5 per cent., 10 per cent., 20 per cent., and 50 per cent. of CO_2 inhibit the softening rates of apples, the retardation varying with the CO_2 concentrations at temperature of 71.5°F. (22°C.). Five per cent. and 10 per cent. concentrations of CO_2 had no appreciable effect upon the flavour of the apples.

A bibliography is attached to this paper.—A. B.

Apricot, A New Tumour on the. By A. Khazanoff (*Jour. Agr. Res.*, vol. xxvi. No. 2, Oct. 1923, pp. 45-60; 13 plates).—The apricot gall disease resembles the galls produced by the crown-gall organism, but may be distinguished from them by the fact that the apricot galls are bark outgrowths without woody tissues becoming involved, and that the apricot gall is thoroughly permeated with gum. Apart from gummosis and hyperplasia is the divergence of cork strands from their normal course on the exterior of the phloem to penetrate the phloem tissue to relatively great distances, reaching sometimes close to the cambium. The etiology of the disease has not been established with absolute certainty, but it is believed that *Monochaetia rosenwaldia* is the causal organism. Inoculations with such a fungus induced the formation of galls upon healthy apricot trees.

Control measures, based upon excision and Bordeaux paste, gave fully satisfactory results.—A. B.

Arsenicals, Chemical, Physical, and Insecticidal Properties of. By F. C. Cook and N. E. McIndoo (*U.S.A. Dep. Agr., Bull.* 1147, June 9, 1923, pp. 1-57).—The investigation was to gain information for the possible improvement of arsenicals for insecticidal purposes.

The arsenicals studied were acid and basic lead arsenate, arsenious oxide, arsenic oxide, Paris green, calcium arsenate, zinc arsenite, sodium arsenate, potassium arsenate, magnesium arsenate, and London purple.

The results of analyses and the physical properties are arranged in tabulated form. Comparative toxicity tests were carried out on a number of moth and beetle larvae, grasshoppers, and honey-bees.

The general properties of arsenicals and their compatibility with other insecticides and fungicides are discussed. The conclusion arrived at was that both a chemical analysis and a thorough toxicity study are required in order to judge whether or not a particular arsenical is a satisfactory insecticide.

G. F. W.

Avocado. By G. F. Moznette (*U.S.A. Dep. Agr., Farm Bull.* 1261, pp. 1-31; 21 figs.).—The Avocado is attacked by many insect pests, which must be controlled by spraying. Two applications of oil emulsion in winter (1 in 70) at intervals of three weeks will kill *Dictyospermum* and pyriform scale, and another treatment in spring after the fruit has set will dispose of white fly (*Trialeurodes floridensis*), and lead arsenate (1½ lb. to 50 gallons of water) kills the blossom anomala (*A. undulata*) and 1 in 50 the leaf roller (*Gracilaria perseae*). A nicotine soap spray controls blossom thrips (*Frankliniella cephalicus*) and the lace bug (*Acyta perseae*). Dusting with powdered sulphur disposes of red spider, but if leaf thrips (*Heliothrips haemorrhoides*) are also present it is better to spray with a mixture of fish-oil soap and nicotine sulphate. After the fruit is harvested lime sulphur spray is used. Weevils and the Mediterranean fruit fly also cause much damage.—S. E. W.

Azotification. By J. E. Greaves and D. H. Nelson (*U.S. Agr. Exp. Sta., Utah, Bull.* 185, pp. 1-23).—Farmyard manure encourages the bacteria which convey nitrogen to the soil by furnishing them with food and increasing their azotifying activities. Commercial fertilizers, on the other hand, may discourage the bacteria.

S. E. W.

Bacteria in Soil, The Determination of the Number of. By C. L. Whittles (*Jour. of Agri. Science*, vol. xiv. Part 3, July 1924, pp. 346-369; 6 figs.).—An apparatus is described which has been designed to impart a known number of vibrations per minute to a suspension of soil or other material. The problem of the calibration of the apparatus is briefly discussed.

A new method for the comparison of the mechanical composition of suspensions is described. Various preliminary treatments of samples of soil for mechanical analysis are compared, and it is shown that: (a) The rate of wetting is an important factor; (b) a combination of trituration and vibration gives a satisfactory degree of dispersion; (c) the use of acids is not advisable.—A. S.

Barberries, berried. By F. J. C. (*Gard. Chron.*, Feb. 16, 1924, p. 93).—A valuable record of the origin of many of the newer forms raised from seed at Wisley.—E. A. B.

Barberry Eradication and Black Rust in Europe. By E. C. Stakman (*U.S.A. Dept. Agr., Circ.* 289, April 1923, pp. 1-14).

Barberry and Chemicals. By N. F. Thompson (*U.S.A. Dep. Agr., Circ.* 268, March 1923, pp. 1-4; figs.).—These two circulars show that the immunity of wheat to black rust in various countries is largely due to the complete eradication of the common barberry and urge farmers and authorities in the States to carry on a similar campaign against the barberry in wheat-growing centres. Common salt is suggested as a very suitable means of eradication.—A. B.

Bean Anthracnose. By M. F. Barrus (*U.S. Exp. Sta., Cornell*, July 1921, Memoir 42, pp. 96-210; 8 plates).—Bean anthracnose is a disease of beans affecting chiefly *Phaseolus vulgaris* L., and which causes considerable loss. All parts of the plant are subject to the disease, but it is most noticeable on the pods, where it forms dark, sunken cankers which extend down to the seeds. The spores readily germinate at room temperatures within 24 hours in nutrient culture media. The fungus, after entering the host, extends its hyphae horizontally and diagonally into the cells. The cells become brown and collapse and a stroma is formed with numerous conidiophores. The fungus can live over two years in the tissues of the plant. There are at least two strains or biological forms of the fungus. Many varieties of *Phaseolus vulgaris* are resistant to one but susceptible to the other. Some varieties are susceptible to both strains, and at least one is highly resistant to both strains of the fungus. It is suggested that the use of resistant varieties gives the greatest promise of a satisfactory means of control. A good bibliography is appended, and some excellent coloured plates are included in the paper.—A. B.

Beans, Insects and other Animal Pests injurious to, in New York. By I. M. Hawley (*U.S.A. Exp. Sta., Cornell, Memoir* 55, May 1922, pp. 949-1037; 3 plates, 16 figs.).—A complete treatise on the principal pests of field beans, together with remedial measures. Over twenty pests are described, of which the following are injurious to beans in Britain: (i.) seed-corn maggot (*Hylemyia ciliocrura*); (ii.) grey slug (*Agriolimax agrestis*); (iii.) red spider (*Tetranychus telarius*); and (iv.) the tarnished plant bug (*Lygus pratensis*).

Complete descriptions are given of the several stages of the seed-corn maggot, grey slug, pale striped (*Systema taeniata*) and red-headed flea-beetles (*S. frontalis*). There are thirteen pages of bibliography.—G. F. W.

Beet Leaf Beetle, The. By F. H. Chittenden and H. O. Marsh (*U.S. Dep. Agr., Bur. Entom. Prof. Paper, Bull.* 892, Oct. 1920; 9 plates, 4 figs.).—In the Rocky Mountain States sugar beets are subject to attacks by the beet leaf beetle (*Monoxia puncticolis* Say). The principal injury is caused by the larva, but the adult beetle inflicts considerable damage. The insect resembles the elm leaf beetle in appearance, and passes the winter under tufts of grass and dead weeds, and must be destroyed there, as arsenical and other sprays are of very little use in controlling it.—V. G. J.

Beet Leaf Beetle, The, and its Control. By F. H. Chittenden (*U.S. Dep. Agr., Bur. Entom., Farm. Bull.* 1193, March 1921; 8 figs.).—Ladybird beetles of three species devour the eggs of this insect; a bug, *Perillus bioculatus* Fab., feeds on the larvæ and beetles. Chickens also have been used to advantage in destroying the beetles.—V. G. J.

Berberis morrisonensis Hayata (*Bot. Mag.* t. 9017; Sept. 1924).—Nearly allied to *B. diaphana*, this Formosan species has proved quite hardy. The fruit is elliptic and scarlet, and the foliage becomes scarlet in autumn.—F. J. C.

Bindweed, Eradication. By L. E. Call and R. E. Getty (*Agr. Exp. Stn., Kansas, College Circ.* 101, pp. 1-18; 9 figs.).—Ground infested with bindweed should be frequently ploughed and used for hog pasture. Another plan is to

plant a smother crop of alfalfa or sorghum in summer or autumn on the deep-ploughed land. The crop must be gathered before the convolvulus seeds.—S. E. W.

Bordeaux-Oil Emulsion. By J. R. Winston, J. J. Bowman, and W. W. Yothers (*U.S. Dep. Agr., Bull.* 1178, Nov. 21, 1923, 23 pp.; 3 figs.).—Promising success has been attained by the use of a 3-3-50 Bordeaux mixture and 1 per cent. oil in the form of an emulsion against Citrus scab and melanose, besides rust mites, red spider, and scale insects.

The advantages of the mixture over plain Bordeaux is that the former settles less rapidly, spreads more evenly, and mixes equally well with hard and soft waters.

The three figures show (i.) the periods of activity of the above-mentioned fungus diseases and insect pests in a Florida Citrus grove, (ii.) the rates of settling of Bordeaux and Bordeaux-oil mixtures, and (iii.) the persistence of copper residue on Citrus leaves compared with the rainfall.

There are two tables showing the effect of the two washes on fungi and insects.

G. F. W.

Boykinia tellimoides Engl. and Irm. (*Bot. Mag.* t. 9002; June 1924).—Better known as *Saxifraga tellimoides*, this Japanese plant is a handsome one as regards its foliage, but the flowers are rather poor. It grows well in pots and probably in half-shady positions in cool soil, for it is a woodland plant growing by running water.—F. J. C.

Bulbophyllum triste Reich. f. (*Bot. Mag.* t. 8493; Oct. 1922).—A small-flowered species of curious habit from Sikkim and Lower Burma, flowering early in spring.—F. J. C.

Bunt in Wheat, Control of. By W. W. Mackie and Fred. N. Briggs (*U.S. Agr. Exp. Stn., California, Bull.* 364, May 1923, pp. 532-572; 3 plates).—Many fungicidal solutions, though destructive to bunt spores on the seed, tend to injure the seed germs. Distorted plants, delayed growth, and poor crops result; bluestone represses root growth and formaldehyde represses plumule development. The authors made use of copper carbonate dust (2 oz. to the bushel), which effectively controlled the bunt when the seed was not blackened with the spores. Germination of the seed was not inhibited by the copper carbonate dust. This should be of a fineness to pass through a 200-mesh sieve, of a light green colour, and of a total copper percentage of 93 to 94. It should not be inhaled by the operator, who should wear a dust mask.—A. B.

Cabbage, Diseases of. By L. L. Harter and L. R. Jones (*U.S. Dep. Agr., Farm. Bull.* 1351, Sept. 1923, pp. 1-29).—The paper deals in a popular way with the commoner diseases of the Cabbage and its allies (e.g. Clubroot, Root-knot, Black-rot, Yellow-rot, Soft-rot, White-rust, Black leafspot, Damping off), and gives various measures of plant sanitation as a means of control. The present bulletin is a revision of and replaces *Bull.* 925.—A. B.

Cabbage Flea Beetle: The Western. By F. H. Chittenden and H. O. Marsh (*U.S. Dep. Agr., Bur. Entom., Bull.* 902, Oct. 1920; 1 plate, 4 figs.).—Cabbage, turnip, sugar beet, and other vegetables and garden plants are severely injured by this beetle. Injury is chiefly due to the over-wintered beetles during June and July. The entire life-cycle may be passed in about thirty days, and there are at least three generations annually. Arsenate of lead and Bordeaux mixture act as repellents. It can also be controlled by nicotine sulphate, $\frac{1}{2}$ pint 40 per cent. solution in 50 gallons of water with 2 lb. of soap added.—V. G. J.

Cabbage Maggot, The. By G. W. Herrick and W. Colman (*U.S.A. Exp. Stn., Cornell, Bull.* 413, Dec. 1922, pp. 3-15; 8 figs.).—Brief descriptions are given of the egg, larval, pupal, and adult stages.

Marked success has followed the use of corrosive sublimate (mercuric chloride) when used at the rate of 1 oz. to 8-10 gallons of water, applied to radishes and cabbages once a week during the growing season. The first application is made as soon as the plants have come through the ground, care being taken to direct the solution below the leaves and as near the stems as possible.

A series of tables show (i.) the results obtained, (ii.) the necessary amount of material for one acre, and (iii.) the time taken to apply the solution.—G. F. W.

Cabbage Seed. By J. C. Walker (*U.S. Dep. Agr., Circ.* 311, pp. 1-4; 2 figs.).—It is advisable to disinfect cabbage seed before sowing, as two dangerous diseases (Black-leg and Black-rot) are seed borne. The soil in cold frames or hot beds must be sterilized before the seed is sown. Disinfection is accomplished by

immersion in an aqueous solution of mercuric chloride (1 in 1,000) for 30 minutes, or by soaking in water at 122° F. for half an hour. The seed is then dried. The first method does not injure the seed, but may not destroy all the Blackleg fungus.—S. E. W.

Callistachys ovata Sims (*Bot. Mag.* t. 8998; March 1924).—An Australian shrub of 16 to 18 ft., hardy only in favoured parts of S.W. Cornwall and Scilly, bearing terminal clusters of orange papilionaceous flowers.—F. J. C.

Canning of Fruit and Vegetables, A Study of the Factors affecting Temperature Changes in the Container during the. By C. A. Magoon and C. W. Culpepper (*U.S. Dep. Agr., Bull.* 956, August 1921; 56 figs.).—A satisfactory apparatus has been devised for measuring the temperature changes at the centre of the can during the processing period and the subsequent cooling, which permits the use of the mercury thermometer both in the water bath and in the steam retort.—V. G. J.

Carmichaelia australis R. Br. (*Bot. Mag.* t. 8972).—A well-known, almost leafless shrub, hardy in sheltered places in southern England, and native of both islands New Zealand. The plants of this genus are difficult of classification, since their vegetative characters vary enormously.—F. J. C.

Cassiope selaginoides Hook. f. and Thoms. f. *canescens* (*Bot. Mag.* t. 9003b; June 1924).—A dwarf native of China and the Himalaya, forming tufts of upright stems with closely appressed leaves, and bearing nodding white bell-shaped flowers. Probably hardy.—F. J. C.

Celery. By W. R. Beattie (*U.S.A. Dep. Agr., Farm. Bull.* 1269, pp. 1-32; 21 figs.).—The soil for the cultivation of celery should receive a dressing of 1,600 lb. per acre of a fertilizer containing 4 per cent. nitrogen, 8 per cent. phosphoric acid, and 7 per cent. potash. When the seedlings are 1½ in. high the tap roots are cut to induce fibrous root growth before planting out. Firm planting is essential. Water the newly planted seedlings and mulch with lawn clippings or short manure to preserve moisture. Spraying with Bordeaux mixture protects the crop from blight. Celery in cold storage must not be cooled below 30° F.—S. E. W.

Celery, Root Rot (*Phoma*) of. By C. W. Bennett (*U.S. Agr. Exp. Stn., Michigan, Tech. Bull.* 53, Nov. 1921, pp. 1-40; 8 plates).—*Phoma* Root Rot is a disease of the celery and celeriac, caused by *Phoma apicola*. The fungus may also attack carrot, parsnip, and parsley. The disease starts at the crown of the plants and causes "stunting" and a pinching-off near the ground level. The disease requires a relatively low temperature (18° C.), excess moisture, and oxygen for its growth, and it reaches its maximum of destructiveness in the spring and autumn of the year. As control measures, the removal of weeds and the cultivation of non-susceptible varieties are suggested.—A. B.

Celmisia. By J. McPherson (*Gard. Chron.*, Jan. 5, 1924, pp. 5-7; with 5 figs.).—A list of the most suitable species for cultivation according to experience gained in New Zealand.—E. A. B.

Centradenia floribunda Planch. (*Bot. Mag.* t. 9012; June 1924).—A Guatemalan herb needing stove treatment, bearing numerous rather fugacious pink flowers on branching cymes.—F. J. C.

Chamaebuxus Vayredae Willk. (*Bot. Mag.* t. 9009; June 1924).—Usually called *Polygala Vayredae*, this Pyrenean plant is often grown in rock gardens, flowering in May with bright rose-purple petals of the usual *Polygala* form.—F. J. C.

Chayotes. By L. G. Hoover (*U.S.A. Dep. Agr., Circ.* 286, pp. 1-11; 4 plates, 3 figs.).—The chayote is a prolific bearer of pear-shaped fruits, each weighing from 8 to 16 oz. It is a native of Mexico and Central America, and formed the chief food of the ancient Aztecs and Mayas. It is related to the cucumber. The roots are easily killed by frost, but it may be grown as an annual in the United States as far north as Washington. The fruits are planted in spring in mounds of well-drained sandy loam 12 ft. apart, or the chayote may be propagated from cuttings. The plants are surrounded by a thick, loose mulch which permits their watering. They are rampant growers, requiring support such as a 4-in. mesh wire netting stretched over a T trellis. Well-rotted manure and sodium nitrate must be supplied. Not more than 5 oz. per plant of the

latter as an overdose is fatal. The chayote is attacked by the pickle worm (*Diaphania nitidalis*), which is held in check by spraying with nicotine preparations. Ladybird (*Epilachna borealis*) and the cucumber beetles (*Diabrotica vittata* and *D. duodecimpunctata*) do much damage, but can be killed by lead arsenate sprays. Fungoid attacks generally yield to a mixed Bordeaux and lead arsenate spray. Although the chayote is chiefly grown for its fruit, the young leaves, vine tips, blanched shoots, and tubers are also edible. The foliage is used for fodder, and the silver-white straw makes ornamental hats and baskets.—S. E. W.

Chinese Jujube C. C. Thomas (*U.S. Dep. Agr. Dep., Bull.* 1215, pp. 1-23, 8 figs.).—The Chinese Jujube or Date (*Ziziphus Jujuba*) thrives in hot, dry regions, even where the alkalinity of the soil retards the growth of other fruit trees. It forms a tree 20-40 feet high, bearing heavy crops. The oval fruit has a pointed, oblong stone. The Jujube can be raised from seed or propagated by grafting. It is remarkably free from disease and insect pests. The most satisfactory way of using the fruit is to cook it in syrup for 30 minutes, having previously perforated the skin in several places; allow to cool and again boil in syrup, drain, and dry. Thus prepared it resembles a date and is rich in protein and sugars.—S. E. W.

Cirrhopetalum tripudians Parish et Reichenbach (*Bot. Mag.* t. 8954; Feb. 1923).—An orange-flowered species from Burma and Siam related to *C. reiracium*.—F. J. C.

Citrus, Blast and Black Pit Disease of. By H. S. Fawcett, W. T. Horne, and A. F. Camp (*U.S. Agr. Exp. Stn., California*, May 1923, *Tech. Paper* 5, pp. 1-24; 6 plates).—The diseases of citrus blast and black pitting were formerly thought to be due to two species of bacteria, but are now attributed to one organism (*Pseudomonas citriputale* C. O. Smith); Citrus blast attacks the leaves and twigs, while black pittings occurred in the fruit of the lemon and grape fruit. For control measures a first spraying with Bordeaux mixture in November and a second spraying in December are helpful. The spraying should cover both surfaces of the leaves and twigs to be effective.—A. B.

Citrus Stem Rot, Commercial Control of. By J. R. Winston, H. R. Fulton, and J. J. Bowman (*U.S. Dep. Agr., Cir.* 293, Oct. 1923, pp. 1-12; 7 figs.).—The methods suggested are: (1) Removal of all dead wood; (2) Spray with 3-3-50 Bordeaux mixture plus 1 per cent. oil as emulsion in April or May; (3) Store fruit at low temperatures (40° to 45° F.).—A. B.

Citrus Trees, Fumigation. By W. J. Allen (*Agr. Gaz. N.S.W.* vol. xxxiv, pp. 897-898).—Instead of fumigating with hydrocyanic acid to destroy red scale on citrus trees, calcium cyanide is used. The tree is covered with a tent and finely powdered calcium cyanide is blown in with a special dust-blowing machine.—S. E. W.

Citrus Trees, Gum Diseases of, in California. By H. S. Fawcett (*U.S. Agr. Exp. Stn., California, Bull.* 360, April 1923, pp. 370-424; 15 figs.).—The species of Citrus includes the lemon (*C. limonis*), sweet orange (*C. sinensis*), sour orange (*C. grandis*), and citron (*C. medica*), and these species are subject to various gum diseases: Pythiacystis (Brown-rot) gummosis (a widespread and destructive disease on the lemon); Mal di Gomma (Foot-rot) due to *Phytophthora terrestris* Sherbakoff; Botrytis gummosis due to *Botrytis cinerea*; Scaly Back of the orange; Diplodia gummosis and Exanthema.

Details are given for the control of these several diseases.—A. B.

Clethra Delavayi Franch. (*Bot. Mag.* t. 8970).—This, when at its best, must be one of the most beautiful shrubs from Yunnan, whence seed was sent in 1913 by Forrest. It has grown and flowered in open wood without shelter at Sunningdale. The flowers are in long racemes, white, campanulate, about $\frac{1}{2}$ in. in diameter and with deep pink calyces, and the shrub flowers freely when established.—F. J. C.

Clover Bacterial Leafspot. By L. R. Jones, M. M. Williamson, Dr. F. A. Wolf, and Lucia McCulloch (*Jour. Agr. Research*, vol. xxv. No. 12, Sept. 1923, pp. 471-490; 6 plates).—This paper describes a new bacterial leafspot disease on various species of clover, including *Trifolium pratense*; *T. medium*; *T. repens*;

T. repens var. *latum*; *T. hybridum*; *T. incarnatum*; *T. alexandrinum*; and *T. pannonicum*. It occurs in Wisconsin, Iowa, Virginia, and other States, and is probably widely prevalent.

Leaves, stems, stipules, and petioles are infected, but lesions have not been observed on the floral organs.

The spots may appear at any time and at first are minute translucent dots which enlarge and become irregular blackish-brown areas. These have a translucent border and the surrounding tissues are yellowish-green. A white, milky exudate is formed on the lower leaf surface which soon dries in a white film. The causal organism is *Bacterium trifoliorum* sp. It forms whitish colonies on nutrient agar, is flagellate, and forms acid from dextrose and saccharose. According to the descriptive chart its group number is 212.2322023. The organism is disseminated with the seeds and such seeds in new plantings are primary loci of infection. Rain and leaf-eating insects also disseminate the disease.—A. B.

Corokia buddleioides A. Cunn. (*Bot. Mag.* t. 9019; Sept. 1924).—A rather tender N. Zealand shrub up to 12 feet tall, with silvery grey young branches and narrow long leaves, bright green above and silvery beneath. Flowers, small yellow.—F. J. C.

Cotoneaster salicifolia Franch. (*Bot. Mag.* t. 8999; March 1924).—Hitherto known in gardens as *C. salicifolia* v. *floccosa*, this plant is fairly widely distributed. It is a graceful shrub with slender smooth red branches and narrow leaves, dark green above, grey beneath. A hardy native of W. Szechwan, whence it was sent home by E. H. Wilson.—F. J. C.

Cotton, Diseases of. By W. A. Birmingham and I. G. Hamilton (*Agr. Gaz. N.S.W.* vol. xxxiv. pp. 805-810, 877-886; 15 figs.).—The cotton plant is subject to the following diseases: Physiological.—Boll shedding occurs when the amount of water taken in by the roots is less than that given out by the leaves. This may be due to exposure to strong winds or drought, or to the asphyxiation of the roots in water-logged soil. Rust: the leaves turn red and drop off prematurely. This is caused by a deficiency of potash. Club leaf (*Cyrosis*) is most injurious in hot weather. To avoid it plant early. Blue cotton: the leaves turn blue and the fruit falls. Organic manure aggravates the disease.

Bacterial diseases.—Angular leafspot, caused by *Bacterium malvacearum*, damages the boll and causes seedlings to wilt. The seed may be sterilized after removal of lint by immersion in strong sulphuric acid, by treatment with hot water at 161° F. for eighteen minutes or an aqueous solution of mercuric chloride 1 in 1000 for one hour. Anthracnose (*Glomeralla Gossypii*) causes young seedlings to damp off and attacks the bolls and stems. As a preventive, use sterilized seed and grow varieties least troubled by the disease, and have a two-year crop rotation.

A suitable crop rotation is the only way of keeping in check cotton wilt or blackroot, due to *Fusarium vasinfectum*. Resistant varieties should be chosen for cultivation. Texas root rot: the roots are covered by a whitish mould, indicating the presence of *Ozonium omnivorum*. No satisfactory remedy has been discovered. *Rhizoctonia solani* causes sore shin, which is recognized by the appearance of cankerous spots on the leaves and stems. As a preventive, treat the seed with 2½ per cent. its weight of naphthalene mixed with gypsum. *Sclerotium Rolfsii* is the cause of southern blight. *Macrosporium nigricantium* is responsible for black rust or leafspot. False or areolate mildew attacks the older leaves; it is caused by *Ramularia areola*. *Uredo Gossypii* produces rust. *Diploda gossypina* attacks injured bolls and boll rot results. In wet seasons a species of *Fusarium* induces Fusarium boll rot. *Alternaria*, mildew, *Hymenochaete noxia*, *Phyllosticta Malhoeffi*, and *Phoma Roumii* are fungoid enemies of the cotton plant. Eelworms (*Heterodera radicicola*) do considerable damage to cotton plants, but their activities can be checked by suitable rotation of crops.—S. E. W.

Crane-flies of New York, The. Part II. Biology and Phylogeny. By C. P. Alexander (*U.S. Exp. Sta., Cornell, Memoir* 38, June 1920, pp. 695-1133; 86 plates).—This memoir deals with the morphological characters of Tipulid larvæ and pupæ. Keys to each family, tribe, and sub-group are appended.

Other aspects dealt with are summaries of life-history records, larval habitats, economic importance, biology and distribution of the species.

Many British species are represented in North America.

There are 24 pages of bibliography.—G. F. W.

Crataegus, The Insect Fauna of the Genus. By W. H. Wellhouse (*U.S. Exp. Sta., Cornell, Memoir* 56, June 1922, pp. 1045-1136; 26 figs.).—A catalogue of the insects occurring on the genus *Crataegus* in central New York, and the list is extended to include insects that other authors have found on these plants in five continents.

Three hundred and eighty-two spp. of insects and mites, representing nine orders, are mentioned: Acarina, 10 spp.; Orthoptera, 4 spp.; Odonata, 1 sp.; Hemiptera, 84 spp.; Thysanoptera, 1 sp.; Coleoptera, 74 spp.; Lepidoptera, 184 spp.; Diptera, 16 spp.; and Hymenoptera, 8 spp.

The recorded European spp. number 203.

The first part of the memoir is devoted to the habitats of the genus *Crataegus*, ecological summary, relation of the genus to apple, pear, and quince, and biological notes on the insects observed by the author during the years 1917-1920.

The latter half is given over to a catalogue of insect pests, arranged under their natural orders with information as to host plants, injury, distribution, and literature.—G. F. W.

Crops, Effect of Borax. By J. J. Skinner, B. E. Brown, and F. R. Reid (*U.S. Dep. Agr., Bull.* 1126, pp. 1-30; 11 col. plates).—The injurious effect of borax on seed germination and plant growth is mitigated by heavy rainfall. The potato tolerates a larger quantity of borax than corn or beans. It has been pointed out in a former abstract in this JOURNAL that more harm is done when the fertilizer containing borax is drilled in the furrow immediately before planting than when the fertilizer is applied some time before planting or when it is broadcasted. The evil effect of the borax disappears in the course of twelve months.—S. E. W.

Crow in its Relation to Agriculture. By E. R. Kalmbach (*U.S. Dep. Agr., Farm. Bull.* 1102, August 1920; 4 figs.).—Although the crow is to a large extent a pest, destroying, as it does, large quantities of corn, and raiding the poultry yards, it is also a very valuable ally of the farmer in many respects. Insects supply about one-fifth of its food, and those preyed upon include some of the worst pests, such as grasshoppers, caterpillars, and chafer grubs.—V. G. J.

Crown-gall Organism and its Host Tissue. By A. J. Riker (*Jour. Agr. Res.*, vol. xxv. No. 3, July 1923, pp. 119-132; 5 plates).—Crown-gall infection in tomato stems takes place only through wounds. The organisms have a positively chemotactic response to expressed tomato sap. When needle punctures are made into turgid tomato and tobacco stems, the intercellular spaces above and below are filled by liquid and become water-soaked; and these areas give rise to galls. The organisms can travel along the bundles. When a continuous channel of liquid was provided in the stem, either by mechanical pressure or by freezing, the bacteria migrated and produced galls several centimetres from the point of inoculation. The usual methods of staining failed to demonstrate the bacteria *in situ* due to the staining of the adjacent cell wall and substances in the intercellular spaces of a similar intensity to that of the bacteria. The bacteria, however, were observed in unstained sections in the neighbourhood of the wound and also in gall tissue of all ages from the time of inoculation up to 24 days.

A short bibliography is appended.—A. B.

Crown-gall Organism and Host Tissues. By A. J. Riker (*Jour. Agr. Res.*, vol. xxvi. No. 9, Dec. 1923, pp. 425-436; 6 plates).—The crown-gall bacteria have been consistently observed in the intercellular spaces of tomato stems which had been inoculated, at 2-day intervals, until the galls showed mature characters (hyperplasia, hypertrophy, and vascular elements). The bacteria were found to be associated with a change in neighbouring cell walls, which was indicated by a change in colour, in staining reactions, and in the power of double refraction of light. The bacterial stimulus appears to attract the dividing nuclei to the adjacent part of the cell and thus disturb the polarity of the cell. The walls from the early divisions were laid down in that portion of the mother cell near the intercellular space containing the bacteria. The manner of cell division in the early stages indicated the source of the stimulus and the position of the bacteria. The younger galls appeared to be composed of groups of sheaths or strands of tumour tissue surrounding the invaded intercellular spaces. Calcium oxalate was found deposited in much larger quantities in the gall tissue than in normal tissue. Tumour strands have been secured only when the inoculation puncture was made in region of elongation close behind the condensed buds of the sunflower, sweet pea, and tobacco. No evidence has been found to show

that secondary tumours invade the normal tissues. They appear to be part of the primary gall which was carried up by elongation of the invaded region.

A. B.

Cruciferous Crops, Insect Pests of. By H. W. Miles (*Kirton Agr. Institute, Bull.* 1, May 1924, pp. 1-39; 20 figs.).—A survey of the chief pests of crucifers arranged under the headings of root, stem, leaf, flower, and seed depredators.

A useful key is given for identifying insect pests by the description of the symptoms of attack.

Each pest is described in detail, together with the life-history and full preventive and remedial measures.

The pests include (i.) root feeders (wireworms, cutworms, and cabbage-root fly); (ii.) stem feeders (turnip gall weevil, mud beetle, cutworms, leather-jackets, and cabbage-stem flea beetle); (iii.) leaf feeders (diamond-back moth, cabbage butterflies and moth, cutworms, mustard beetle, flea beetles, cabbage aphid and white fly, turnip sawfly, leaf-miners, and swede midge); (iv.) flower feeders (pollen beetle and diamond-back moth); and (v.) seed-vessel feeders (mustard and pollen beetles, seed weevil and seed midge).

The accompanying figures of insects and their larvæ and damaged host plants are so good that identification is comparatively simple. The recommendation to use an arsenical wash on cabbages against the attacks of moth larvæ is to be deprecated, except when the plants are very young.—G. F. W.

Cucumber-House Wood-louse, The Action of some Organic Compounds upon the. By E. R. Speyer and Owen Owen (*Ann. App. Biol.*, xi. No. 2, July 1924, pp. 236-243; 1 fig.).—A series of experiments were carried out to ascertain the action of twenty aromatic compounds on hibernating wood-lice. Descriptions are given on the toxicity due to contact, vapour, and mixing with compost.

Different compounds act in different ways on the organism of the animal, some affecting the nervous system, others the respiratory system, and one causing rapid death only by contact.

Naphthalene ceases to act in the soil on the fourth day after mixing, while phenol and the cresols prove to be the most active.

Certain compounds show a maximum activity shortly before their disappearance from the soil. Para-compounds gave a much slower action than ortho-compounds.

A graph shows the percentage of wood-lice killed in twenty-four hours, and the period over which six compounds, mixed with the soil, proved toxic.

All the compounds used are injurious to plant life, and must therefore be allowed to disappear from the soil prior to sowing and planting.

Tomato seed will germinate normally if sown twenty days after mixing the soil with 1 part phenol to 750 parts of soil, and at this strength 100 per cent. wood-lice are killed for six days after mixing.—G. F. W.

Cucumbers, Bacterial Spot of. By F. C. Meier and G. K. K. Link (*U.S. Dept. Agr., Cir.* 234, Aug. 1922, pp. 1-6; 1 plate).—This circular deals in a popular way with the ravages of *Bacterium lachrymans* on cucumbers. The disease causes minute circular water-soaked spots upon the fruits and also causes a leaf-spot disease. The spots soon exude a white gummy mass containing the bacteria. Seed disinfection and crop rotation is the most satisfactory method of reducing loss from this disease. At least two years' interval should be allowed between the successive plantings in the same ground.—A. B.

Cucumbers in Greenhouses. By J. H. Beattie (*U.S. Dep. Agr., Farm. Bull.* 1320, pp. 1-29; 18 figs.).—Cucumbers under glass require uniform temperature and freedom from draughts, light, loamy, sterilized soil enriched with stable manure and artificial fertilizers (1,000-2,000 lb. to the acre) containing superphosphate 7-9 per cent., potash 4-5 per cent. (as potassium chloride), and nitrogen 4-5 per cent.; half as sodium nitrate or ammonium sulphate and half as dried blood. The growth of the plants must be rapid and not checked by a fall in temperature. Repeated applications of fertilizer containing potash phosphate and nitrogen, and rich in organic matter, are necessary. Hives of bees are placed either in the greenhouse or in its immediate proximity to ensure pollination. Pollination with a camel's-hair brush is laborious and unsuitable for large houses [This is necessary only when seed is required, not for fruit formation.—Ed.]

Enemies of the Cucumber are Red Spider, the Striped Cucumber Beetle, Aphides, and White Fly. Fumigation with hydrocyanic acid is an effective remedy for the two last-mentioned pests. Anthracnose, Downy Mildew, Bacterial Wilt, Mosaic Disease, and Root-knot are very destructive to the plants.—S. E. W.

Cypripedium himalaicum Rolfe (*Bot. Mag.* t. 8965; May 1923).—A terrestrial species from Sikkim with reddish, almost globular flowers, grown by Mr. Elwes in loam, leaf mould, and sand in a shady frame, where it flowered in June. Confused at one time with *C. macranthum*, from which and the allied *C. tibeticum* it is distinct.—*F. J. C.*

Dendrobium laevifolium Stapf (*Bot. Mag.* t. 9011; June 1924).—An epiphytic species from the Louisiades Archipelago, where it grows on mossy saplings in the mist belt of the mountains. It is a dwarf plant with rather small rosy-purple flowers with a yellow labellum.—*F. J. C.*

Dendrochilum uncatum Reichb. f. (*Bot. Mag.* t. 9015; Sept. 1924).—Epiphytic. Bearing long drooping racemes of small green flowers. Native of Philippines.—*F. J. C.*

Deutzia pulchra Vidal (*Bot. Mag.* t. 8962; May 1923).—An erect shrub with scaly branches, rather long petioles, lanceolate leaves, and panicles of narrow white flowers. Native of the Philippines and Formosa. Probably not hardy.
F. J. C.

Dictamnus albus var. *caucasicus* Rouy (*Bot. Mag.* t. 8961; May 1923).—A larger plant in all parts than *D. albus*, with rosy flowers lined with purple.—*F. J. C.*

Didymocarpus Wattiana. By W. G. Craib (*Gard. Chron.*, Feb. 16, 1924, p. 89; fig.).—The first figure of this new species.—*E. A. B.*

Diates (Morea) *spathacea*. By J. W. Besant (*Gard. Chron.*, May 31, pp. 317 and 319; with fig.).—A good figure of this beautiful and hardy species so long confused with *D. Huttonii*.—*E. A. B.*

Dock Sawfly (*Ametastegia glabrata* Fall.), Apples attacked by the Larvæ of the. By F. R. Petherbridge (*Ann. App. Biol.*, vol. xi. No. 1, April 1924, pp. 24-30; 3 figs.).—This leaf-feeding larva is usually found on docks and polygonums, but in October 1922 it was reported as boring into the flesh of stored apples in East Norfolk.

The varieties attacked were 'Lord Derby' and 'Bramley's Seedling.'

An historical account is given, together with notes on its distribution, nature of injury, life-history, and short descriptions of the larval, pupal, and adult stages.

Clean cultivation keeps this pest in check by the eradication of the sawfly's natural host plants.—*G. F. W.*

Dracopcephalum Isabellae Forrest (*Bot. Mag.* t. 8952; Feb. 1923).—Collected and introduced by Mr. G. Forrest in Yunnan. Flowers in terminal blunt spikes, deep violet-purple. Hardy and preferring limy soil.—*F. J. C.*

Earwig, The European. By B. B. Fulton (*U.S.A. Exp. Sm., Oregon, Bull.* 207, Aug. 1924, pp. 4-29; 6 figs.).—An account of *Forficula auricularia* L. and its ravages as a household and garden pest.

The points dealt with are: distribution, means of dispersal, disagreeable habits, food and character of injury, life-history, description of the egg, nymphal and adult stages and control measures.

Remedies include trapping and poison baits, the best of which proved to be sodium fluoride mixed with molasses and wheat bran or ground oat hulls.

An organized community effort is essential for success.

A list of the natural enemies is given, but these are, unfortunately, few in number, probably on account of the nocturnal habits of this pest. Two Tachinid parasites, *Digonochaeta setipennis* and *Rhacodineura antiqua*, live in the body of the earwig and prove fatal to it.—*G. F. W.*

Echinocactus Baileyi Rose (*Bot. Mag.* t. 8971).—Flowers large, rosy; stems cylindrical, ridged and very spiny. Native of Mt. Scott, Oklahoma.—*F. J. C.*

Echinocactus undulatus Dietrich (*Bot. Mag.* t. 8951; Feb. 1923).—Native of Mexico. Of the usual *Echinocactus* type of growth and bearing reddish-pink flowers. It is erroneously called *E. crispatus* in gardens.—*F. J. C.*

Echium coeleste Stapf (*Bot. Mag.* t. 8977; Aug. 1923).—A monocarpic erect herb with grey foliage and long blue panicles, confined to the Canary Islands. Grown at Kew in the temperate house.—*F. J. C.*

Electric Discharge, Pot-Culture Experiments with an. By V. H. Blackman and A. T. Legg (*Jour. Agr. Sci.*, vol. xiv. Pt. 2, pp. 268-287, 3 plates, April 1924).—An account of pot-culture experiments with wheat, barley and maize carried out at Rothamsted in the years 1918-1920 partly to demonstrate the effect of electric discharge in a shorter time than field experiments would allow, and partly to study the result of varying the conditions under which the discharge was made.

The results showed that the plants used exhibit increased dry weight when subjected to minute electric currents (of an intensity as low as 0.1×10^{-10} amp. a plant) from wire networks charged to a high voltage suspended above them. Of 28 sets in which the cultural conditions were satisfactory 23 showed an increased yield. A percentage increase in dry weight of 27 ± 5.8 was shown by maize plants grown under glass and little more than a month old. With barley the largest percentage increase was 18 ± 2.4 . Electrification of barley for the first month of the growing season appears to be as effective as electrification during the whole growing season. In one experiment with barley indications of a differential effect of the discharge were obtained, for the increase in grain yield was greater than the increase in total dry weight.

Direct currents were mostly studied, but increased growth was obtained with both direct and alternating current, the alternating current being apparently as effective or even more effective than the direct; the plants themselves, however, are able to bring about a slight rectification of the current. The discharging networks were usually charged positively, but a similar stimulating effect on dry weight production was obtained with a negative charge on the network. Currents of the order of 1×10^{-8} amp. a plant and higher are injurious, causing a reduction of dry weight.

In one experiment plants screened from the normal atmospheric current by a series of parallel "earthed" wires (0.35 mm. diameter) showed, by comparison with the controls, a percentage decrease of 4.7 ± 2.3 , which is hardly significant. It indicates however that though a favourable effect may be exerted by the normal atmospheric (air-earth) currents, yet the effect can be but slight.

These experiments fall into line with those conducted by V. H. Blackman in the field and leave no uncertainty as to the favourable action of the electric discharge.—A. S.

Electro-culture, Field Experiments in. By V. H. Blackman (*Jour. Agr. Sci.*, vol. xiv. Pt. 2, pp. 240-267; April 1924).—An account of field experiments carried out at Lincluden, Rothamsted, and the Harper Adams College during the four years 1917-1920 with oats, barley, wheat, and clover-hay. The discharge was usually given at the rate of 0.5 to 1.0 milliamp. per acre from thin insulated wires stretched above the crop at a height of about 7 ft. and charged to a voltage of 40,000 to 80,000 (crest value). The discharge was usually given for 6 hours a day in two periods, 3 hours in the morning and 3 hours in the afternoon.

Of 18 field experiments considered, 14 gave positive results in favour of the electrified plots, while 4 showed negative results, i.e. decreased yields compared with the controls. Of the 14 positive results only 3 showed increases of less than 10 per cent., while 9 showed increases of 30 per cent. and over, some reaching 50 per cent. and over. Of the 4 negative results none showed a decrease of as much as 10 per cent. Our knowledge of the proper conditions under which the discharge should be given is still so meagre that there is no reason to believe that the increased yields described are the maximum obtainable as a result of electrification.

The mode of action of the current in producing increased growth and yield is still obscure. In several cases the electrified field crops showed a deeper green tint than that of the controls. The effect of the discharge is of the nature of a stimulus making the plants physiologically more efficient. The additional energy available from the current is too small to have any direct effect, since it is only about 1/1000th, or less, of the energy which the plant obtains from sunlight, while the increased yield is of the order of 20 per cent. There is no evidence that gaseous products of the discharge play any part in the stimulation of growth. The additional supply of nitrogen brought to the soil from oxides of nitrogen produced as a result of electrification must be exceedingly small.—A. S.

Epidendrum cristobalense Ames (*Bot. Mag.* t. 8996; March 1924).—A slender orchid with long spikes of small waxy salmon-pink flowers, discovered in San Cristobal, south-west of Cartago, and requiring an intermediate house.

F. J. C.

Euphorbia anoplia Stapf (*Bot. Mag.*, t. 8947; Feb. 1923).—A native of S. Africa in all probability, but locality not certainly known. It is a cactus-like species with small red flowers.—F. J. C.

Exoascus deformans, Biological and Cultural Studies of. By A. J. Mee (*Phytopathology*, 14, pp. 217-233; plates; May 1924).—The fungus of peach curl was isolated and grown in pure culture, and its relations to temperature, drying up and so on were studied. Successful inoculations were made, but attempts to isolate the fungus from diseased or dead twigs and from the soil failed.—F. J. C.

Fertilizers, Atmospheric Nitrogen. By F. E. Allison, J. M. Braham, and J. E. McMurtrey, jun. (*U.S.A. Dep. Agr., Bull.* 1180, Jan. 1924, pp. 1-44; 14 plates).—This bulletin deals with ten atmospheric nitrogen products and their testing in the field during a period of three years.

Cyanamide is not so satisfactory as the others, due probably to factors influencing rate and manner of decomposition in the soil, to the time and manner of its application, and the composition, temperature, and moisture content of the soils.

Ammonium nitrate gave results comparable with sodium nitrate and ammonium sulphate. It is readily available for plant nutrition. Its disadvantage is absorption of water from air. The double salt (ammonium nitrate and ammonium sulphate) produces effects similar to the materials used separately. It is also hygroscopic.

Mixtures of ammonium nitrate and potassium chloride and ammonium nitrate and potassium sulphate were of approximately equal value. Ammonium phosphate and ammoniated superphosphate are excellent nitrogen carriers, giving quick responses, good growth, and satisfactory yields. Ammonium chloride showed some toxic effects. Urea is equally as good as sodium nitrate and gave very satisfactory results. Urea phosphate gave good results with wheat but poor ones with rye. Summed up, all the nitrogen materials tested, with the exception of cyanamide, were of about the same value as sodium nitrate and ammonium sulphate.—A. B.

Flax, Heat Canker in. By C. S. Reddy and W. E. Brentzel (*U.S.A. Dep. Agr., Bull.* No. 1120, Oct. 1922, pp. 1-18; 5 plates).—Heat canker in flax is non-parasitic, but causes considerable loss in flax production. The cortex is usually killed at ground level, and soon the plants topple over and die. Flax plants when over 4 inches high are not so susceptible. Succulent plants are particularly liable to this disease, and this factor and high soil temperatures are the principal causes of the disease. Control measures suggested include early sowing and drilling rows north and south instead of east and west as usual. Shading the young plants would be helpful.—A. B.

Forestry, Quarterly Journal of (No. 1, vol. 18, Jan. 1924).—"The Afforestation of Commons" has so far received but a small share of attention, though an official return prepared for Parliament in 1874 gave the area of commons in England as 1,700,000 acres. At the present time their area is roughly 1½ million acres, or about half as much as the total area of the woodlands of Great Britain. As showing the returns from trees, principally native pines, growing on common lands, it may be stated that in several instances the trees averaged 54.72 cube feet, and when sawn into lumber for the Forestry Committee had more the appearance of pitch pine than of Scotch fir. The afforesting and reafforesting of many of these derelict commons on communal lines would benefit everyone having common rights, i.e. manor lords, freeholders, and commoners. A certain area of the commons must be retained for recreation, even although there are no provisions made for sports on many commons now. If half of the area of our commons were under trees, they would form a valuable asset to the nation as well as the commoner. This paper is by W. Forbes. "The Avondale Forestry Station," by A. C. Forbes, originally communicated to the *Journal of the Department of Agriculture for Ireland*, contains most interesting information that will be of chief value to the cultivator of timber in every part of Ireland. The chief interest attaching to Avondale lies in the growth of a number of coniferous species, which are evidently better suited to the climate than broad-leaved trees. Seven species of silver fir were used in the original planting scheme, and the only absolute failure is the common European species. This was used as a nurse, but entirely failed in its object. Of the spruces, only two species have turned out satisfactorily—Sitka spruce and the ordinary European variety. Amongst all the species tried, the common spruce has pro-

duced the most uniform crops, Douglas fir is fairly well spoken of, and amongst pines the greatest growth has been made by *Pinus insignis*, which is now 40 feet high. Corsican also does well, and of the various larches planted only the European and Japanese are satisfactory. Strange to say, the two species which have proved of greatest value in Irish plantations—Sitka spruce and the Oregon Douglas fir—have both been unlucky in the Avondale plots. Other interesting papers are those on a "Forest Policy for Landowners," by W. E. Hiley, and "Planting Shelter Belts."—*A. D. W.*

Forestry, Quarterly Journal of (No. 2, vol. 18, April 1924).—"Clear Cutting or Shelterwood" is the title of an excellent paper by Sir William Schlich. This question has not yet reached outstanding importance in Great Britain, but it will soon do so, at any rate in the eastern half of it. It may be said that under favourable conditions of soil and climate clear cuttings may be adopted, but where these are non-existing the sheltered method should receive first consideration, unless a soil protection wood is introduced at an early age, or simultaneously with planting.

"Notes on the Empire Forestry Conference in Canada" gives a clear idea of the resources and methods of lumbering that are carried out in Canadian forests. South of the 50th degree of latitude, and for a distance of over 3,000 miles between the Atlantic and Pacific Oceans, a broad belt containing some 1,000 million acres was, until comparatively recently, almost entirely covered with forests, and it is to this area that these notes refer. The problem there, and until the last few years, has been that of disposing of vast natural stocks of timber in the quickest and most profitable manner to the lumberman and the revenues of the country, and the Canadian Government have regarded this problem as one closely bound up with the prosperity of the Dominion and never questioned its wisdom. Several factors have, however, operated, during the last few years, in calling the attention of legislators and the public to the importance of Canadian forests as sources of national wealth, and not merely as a form of spontaneous growth which happened to exist and which it was desirable to make the most of.

"Notes on the Formation and Management of Whitethorn Fences" contains much of value to the student of forestry, particularly in the matter of preparing the ground, planting the Quicks, and after-attention of the fence. A double row is preferable to a single in the formation, and when gapping is carried out it will pay well to replenish the old spent soil. The results of timber sales in Gloucestershire and Buckinghamshire will give a good idea of the value of different native timbers in these districts.—*A. D. W.*

Forestry, Quarterly Journal of (No. 3, vol. 18, July 1924).—"The Common Ash," by A. D. C. Le Seuer, is of considerable interest and value at the present time, when, owing to a dearth of this timber, considerable areas are being planted. It does extremely well on the sides of streams and ravines, but, whilst it prefers sheltered situations, care should be taken to avoid those comparatively low-lying hollows where the air does not circulate freely, as no tree is more liable to damage by frost, especially that type of frost so common in this country about the time when spring growth has been going on for some weeks. A first-quality ash butt should have a fine, smooth, close and light-coloured bark, with about 6 to 8 annual rings per inch diameter. Narrow rings denote a slow-grown, possibly tough wood.

"Notes on the Empire Forestry Conference in Canada" are here continued, as are also "Thinning Practice." An account is given of the Annual Excursion of members to Cumberland and Westmorland, where the grounds and woods of Muncaster Castle, Irton Hall, and Wasdale Hall were examined. Below the terrace on the Muncaster estate the party were shown some 200 fine Oregon Douglas firs, standing in a sheltered dell, 20 to 25 feet apart, and averaging 100 feet high, with several on the lower side of the path containing 110 to 120 cubic feet of timber. An account of a new transplanter is given in detail, a useful outfit for the lining-out of seedling forest trees. The Imperial Forestry Institute at Oxford has had a beginning, and should prove to be a great development in forestry training and research, the title having been adopted at the command of His Majesty the King.—*A. D. W.*

Forestry, Quarterly Journal of (No. 4, vol. 18, October 1924).—"A Forest Policy for Landowners," by W. E. Hiley, includes part 3, which deals with the development of estate woodlands. In previous articles it was pointed out that the present output of our woodlands is only about one-fifth of what it should be under intensive management, so that a great increase in production would be

possible if we were found to be economically practicable, and that the financial returns from forest depend principally on the nearness to markets, and the cheapness of suitable lands. In this concluding article the deductions from these facts as applied to English estates are discussed. "A Note on a Recent Forest Tour in Germany," and "Some Edaphic Factors in Forest Ecology," the former by R. Bourne, and the latter by P. S. Spokes, are well worthy of perusal. In the latter, an attempt has been made to summarize our present knowledge with regard to soil problems which are of interest to the forester. It is proposed to deal firstly with the subject of indicator plants, and its relation to forest ecology and soil science, and in a subsequent article to discuss the present knowledge in connexion with nitrification in woodlands.—A. D. W.

Forestry, Transactions of the Royal Scottish Arboricultural Society (vol. 38, part 1, March 1924).—The Presidential address, by the Rt. Hon. the Earl of Moray, with reference to Darnaway Forest, is particularly interesting, the history being given in detail for a period of nearly two hundred years. Originally, before any systematic planting or afforestation had been undertaken, the district known as Darnaway Forest, now known as the Old Caledonian Forest, was a wide expanse, very much larger than the afforested area now bearing that name. It was probably thinly wooded country, producing trees of timber value, for there is a statement that in the reign of Edward I., when the Comyns were the Custodians of the Forest, they were ordered to supply 400 oaks for the building of Dornoch Castle. In 1729 there are details of a "Roup of Wood" in this forest, which realized £6,900. Records of the last wolves are told in this district, as a letter to the Countess of Moray in 1570 with reference to wolf skins leads us to suppose. The afforestation of Darnaway Forest commenced about 1768 when the first larch was planted, and in forty years from that date fully 11,000,000 trees had been planted in the county of Elgin, and 1,800,000 on other parts of the estate. In an adjoining part of Darnaway Forest, and covering some 320 acres, the trees, about 70 or 80 years of age, realized, for 300 acres, £20,041. The woods at Darnaway have been celebrated for generations, and few estates of the country can boast of such an expanse of splendid full-grown timber.—A. D. W.

Frost Resistance, Colloidal Properties of Winter Wheat Plants in Relation to. By R. Newton (*Jour. Agr. Sci.*, vol. xiv. Pt. 2, pp. 178-191, April 1924).—An account of investigations on the nature of frost resistance in winter wheat carried out in Minnesota and Alberta. Certain colloidal properties of winter wheat have been found to be closely related to frost resistance, and provide indices of hardness which may have practical application in the breeding and selection of hardy varieties by enabling the plant breeder to estimate accurately the hardness of a new strain the first season, instead of having to wait for the results of field experiments extending over a period of years.—A. S.

Fruit Juices, Unfermented. By W. V. Cruess and J. H. Irish (*U.S. Exp. Stn., Univ. California, Circ.* 220, pp. 1-31; 16 figs.).—Grape, Apple, Loganberry, and Pomegranate juice can be preserved by pasteurization at 160-175° F., or by cool storage below 32° F., or the filtered juice can be kept in sterilized vessels if it is charged with carbonic acid under pressure. Orange juice develops a stale flavour in six or eight weeks, but a mixture of orange and lemon juice with sugar is palatable for many months. Grape-fruit juice, to which sugar has been added, sterilized at 165° F. for half an hour, keeps well. The oil from the rind and the white skin must be excluded when the fruit is pressed.—S. E. W.

Fungi, Influence of Fungi upon the Growth of other. By C. L. Porter (*Amer. Jour. Botany*, vol. xi. No. 3, March 1924, pp. 168-188; 3 plates, 9 figs.).—In common with other organisms, fungi are modified by the changes in their environment. Growth is usually checked when two or more fungi are contiguous, and the author, as a result of his experiments, classified these inhibitions into five classes. Helminthosporium was inhibited by various chemicals in a manner similar to that caused by other fungi. These inhibiting qualities may be used to identify the species. A common cause of inhibition is the formation of some product made during the growth of the organism. Seedlings were protected measurably from infection by Helminthosporium by using a bacterium (organism No. 45). Flax seedlings were measurably protected from Fusarium which could only pass with difficulty through a layer of earth heavily infected with the inhibitor. Roots of seedlings and root hairs gave no tropic response in the presence of fungi.

The five types of inhibition were: (i) Mutually intermingling; (ii) growth superficial over contending organism; (iii) slight inhibition; (iv) growth around the contending organism; (v) mutual inhibition at considerable distance.

The explanation of effects produced upon fungi in mixed cultures may be divided into two classes: (a) the nutrients of the medium may have become exhausted; (b) products are formed which are detrimental or beneficial to further growth. By taking advantage of these products, growth of fungi may be inhibited or stimulated to the advantage of man. This has been done experimentally by Potter, Picardo, Beauverie, and the author.

A bibliography is appended.—A. B.

Fungi on Culture Media. By M. T. Cook (*Amer. Jour. Botany*, vol. xi. No. 2, Feb. 1924, pp. 94-99; 2 figs.).—It is well known that species of fungi belonging to widely different groups succeed one another on decaying fruits and vegetables in a more or less definite order. Since the period of life is comparatively short, there may be a succession of several species of fungi in a very brief period of time. Three fundamental principles must be noted: (1) the functions of the independent plant are dependent upon its proper environment; (2) the environment is neither fixed nor constant, therefore the individual plants are subject to a variable environment; (3) the succession or replacement of a species is sometimes very rapid, sometimes very gradual.

The decay of fruits and vegetables is usually begun by fungi that are classed as parasites, although they may be saprophytic in habit. For example, the successive growth on the apple which decays as a result of *Glomerella rufomaculans*. This fungus is followed by *Rhizopus nigricans*, and later by a growth of *Penicillium* sp. No doubt the spores of all three fungi are present at all periods during the decay, but the question is, what factors influence the order of succession? The most common explanations are (a) character of the food; (b) the possible formation of toxins which kill or check the organism secreting them, and make the growth of the succeeding organism possible.

In three series of experiments the author shows that *Sclerotinia cinerea* is followed by *Penicillium* sp. and another *Penicillium* sp.; *Glomerella rufomaculans* is followed by *Rhizopus nigricans*, and this by *Penicillium* sp., and that it would appear that the first fungus furnishes food for the second fungus, and that this does not contain any serious toxic substance.

The author points out that Brown shows that some fungi grow better in air than in 10 per cent. carbon dioxide, while others lag for a short time in a 10 per cent. CO₂ and then make a growth that surpasses that made in the air. He also thinks that some fungi form two volatile products, CO₂ and NH₃, which check the growth of the fungi.—A. B.

Garden-Craft in the Canticles. By Hilderic Friend (*Gard. Chron.*, May 31, 1924, pp. 318 in continuation).—Eight series have appeared at irregular intervals of this scholarly and interesting review of Garden-craft and cultivated plants of the Hebrew scriptures. Those published deal with the words for Paradise and Garden and fishpools and pavilions, means of enclosure, especially hedges of thorny plants, nuts, the fig, pomegranate, orange, apricot, mulberry, vine, and herbs or simples.—E. A. B.

Gentiana rigescens Franch. (*Bot. Mag.* t. 8974; August 1923).—A glabrous plant with rigid red stem, stem-leaves about 1-2 inches long, and groups of five to thirteen 1 inch long, tubular or funnel-shaped blue flowers with minute green dots. From W. Yunnan; flowering November or December.—F. J. C.

Geranium napuligerum (*Gard. Chron.*, June 7, 1924).—A good figure of this dwarf species introduced to cultivation by Farrer.—E. A. B.

Giant Kelp. By R. P. Brandt (*U.S. Dep. Agr., Bull.* 1191, pp. 1-40, 16 figs.).—Giant Kelp (*Macrocystis pyrifera*) produces spores at all times of the year, but the autumn spores develop more rapidly than the others. The sticky spores adhere to the first objects they come in contact with. At the age of six months the plants are eighteen inches high and produce two fronds. They may differentiate into three types: (a) with two fronds, (b) branches forming dense bush, (c) creeping stems with innumerable fronds. These plants attain a length of 100-150 feet. The kelp thrives best in water 40-50 feet deep at a temperature not exceeding 25° C. Blackrot is a destructive agent. Cutting the kelp for two or three weeks every three months induces a healthy condition and favours growth.—S. E. W.

Gipsy Moth Tree Banding Material; How to Make, Use, and Apply it. By C. W. Collins (*U.S. Dep. Agr., Bur. Entom., Bull.* 899, Dec. 1920; 7 plates, 4 figs.). Materials used: (a) coal tar neutral oil having a density of 1.12 to 1.15 at 20° C.; (b) hard coal-tar pitch, melting point about 49° C.; (c) resin oil having a viscosity of 52 at 100° C. Bands are quite narrow, seldom exceeding 1½ in.—V. G. J.

Gladioli, A Bacterial Blight of the. By Lucia McCulloch (*Jour. Agri. Res.*, vol. xxvii, No. 4, Jan. 1924, pp. 225-229; 2 plates).—In the summer of 1922 a disease of the gladioli, attacking the leaves, was reported from the Middle Western States. Leaves were spotted, forming narrow water-soaked spots in the middle area of the leaves. Considerable quantities of bacterial exudate were noted, and this was considered to be a means of dissemination of the disease by the wind and insects. A bacterium was isolated and is described in this paper. It appears to invade the tissues by way of the stomata and to fill up the intercellular spaces and cavities resulting from the destruction of the cell walls.

The name *Bacterium gummisudans* n. sp. is suggested and the following description is given:

A short rod 1 to 2.8 μ \times 0.6 to 0.8 μ ; motile, 1 polar flagellum, capsules present, no spores; aerobic; forms a yellow viscid growth on culture media; does not reduce nitrates; liquefies gelatine, forms acid from dextrose and saccharose; optimum temperature about 30° C. Sensitive to NaCl and to acids. Readily killed by drying and exposure to sunlight from negative; not acid fast. Group number, 211.2322523. Pathogenic on leaves of gladioli, forming angular translucent spots.—A. B.

Grape Diseases. By Frederick T. Bioletti (*U.S. Agr. Exp. Stn. California, Bull.* No. 358, April 1923, pp. 508-526; 3 figs.).—The vine in California is subject to many diseases which go by various names—Black Mildew, Black Measles, Blight, Top Disease, Californian Disease which seems identical with similar troubles in Southern Europe, e.g. Brunissure. Two other diseases are also found in Californian vineyards: Grape Shrivel and Water Berries. Enormous losses occur from these disorders, the causes of which are not yet definitely determined.

The various symptoms are spots and dead areas upon the leaves with brown, red, and yellow coloration; spotting, softening, and premature drying of the fruit, which is soft and flavourless, and in severe cases the death of the whole vine.

The several cases may be classified into three chief types for convenient study: Type I. *Californian Vine Disease*; Type II. *Black Mildew*; Type III. *Water Berries and Grape Shrivel*. These types may be stages of the same disease or different degrees of malnutrition in the vine. Defective nourishment causes Water Berries, increased malnutrition causes Black Mildew in particular vines, but the Californian disease may attack all the vines in a vineyard. It follows that the prevention of the disease depends upon the proper adjustment of the crop to the condition of health and vigour for each vine. Any vine deficient in quantity or quality at the end of a season should be pruned shorter than at the previous pruning. Recovery will depend on how far the disease has progressed. Cases of relatively severely attacked vines may often be saved by pruning down to the base buds and by subsequent cultural measures to increase the vigour of the plants.—A. B.

Green Manuring. By C. V. Piper and A. J. Pieters (*U.S.A. Dep. Agr., Farm. Bull.* 1250, pp. 1-45; 15 figs.).—Green manuring improves the texture of the soil and increases its capacity for retaining moisture. It also increases the supply of nitrogen. The crops usually grown for this purpose are clover, alfalfa, cow peas (*Vigna sinensis*), soy beans, velvet beans (*Stizolobium decringianum*), vetch, field pea, lupine, yellow trefoil, rape, and white mustard. If the soil is very poor it is advisable to stimulate growth by the addition of potassium chloride and superphosphate. The particular crop to be grown for green manuring depends on the locality. If possible the crop should be ploughed under at least two weeks before the next crop is planted.—S. E. W.

Haemanthus Lynesii Stapf (*Bot. Mag.* t. 8975; August 1923).—Nearly related to *H. multiflorus* with a nearly globose umbel of mostly yellow flowers with scarlet filaments. Native of the Sudan and requiring stove-house treatment.—F. J. C.

Hardenbergia Comptoniana Benth. (*Bot. Mag.* t. 8992; March 1924).—An Australian climbing shrub with many synonyms, allied to *H. monophylla* but with tri- or quinque-foliolate leaves. It is hardy in S.W. Cornwall, but needs protection from cold winds. Its purple or violet-blue flowers are produced in winter.—F. J. C.

Hawaiian Fruits and Jelly Making. By J. C. Ripperton (*Honolulu Exp. Sta., Bull.* 47, pp. 1-24; 2 figs.).—The consistency of a jelly depends largely on the physical properties of the pectin present in the fruit juice. Short-fibred pectin produces a weak jelly, as is the case with grapes and Roselle, but a dense, long-fibred pectin forms a strong jelly, such as is obtained from Guava and Poha. Good results are obtained when the following proportions are observed:

	Pectin. Per cent.	Acid. Per cent.	Sugar. Per cent.
Guava . . .	0.48-0.7	0.6-0.75	60-70
Grape (minimum)	0.56	0.7-0.85	60-67
Roselle . . .	0.63	0.5-0.7	63-72
Poha . . .	0.35	0.8-1.0	70-75
			S. E. W.

Hemerocallis nana G. Forrest and W. W. Smith (*Bot. Mag.* t. 8968; August 1923).—A small species (see figure in this JOURNAL, vol. 42, p. 41) with narrow linear leaves about 6 in. long, and solitary or rarely paired orange flowers, introduced by Forrest from N.W. Yunnan. [The plant is not apparently a good doer in this country, but is probably hardy.]—F. J. C.

Insecticidal Properties, Plants tested for, or reported to possess. By N. E. McIndoo and A. F. Sievers (*U.S.A. Dep. Agr., Bull.* 1201, March 19, 1924, pp. 1-61; 8 tables).—The authors have catalogued 260 species of plants, of which only about 5 per cent. furnish material for efficient insecticides.

The plants regarded as satisfactorily efficient include 3 spp. of *Chrysanthemum* (*cinerariaefolium*, *coccineum*, and *marshallii*), which are used for making pyrethrum or insect powder, 2 spp. of *Derris* (*elliptica* and *uliginosa*), and a Peruvian plant, known locally as "cube" (species not determined).

Extracts of the above, combined with soap, proved to be promising contact insecticides and compare favourably with nicotine sulphate both in efficiency and cost.

Ten other species of plants have been determined by the authors and other writers as efficient against certain species of insects. A list is given of thirty other species of plants which possess insecticidal properties but proved to be inefficient against the insects used in the tests.

The first part is devoted to the economic aspects of plant insecticides, methods used by the authors in preparing the plants, insects employed and methods of testing preparations against them, together with the results obtained.

A catalogue of plants tested and reported to possess insecticidal properties is given with their local names, natural orders, and references to literature.

Ninety-five papers are included in the bibliography.—G. F. W.

Insecticides, Studies on Contact. By C. H. Richardson and C. R. Smith (*U.S.A. Dep. Agr., Bull.* 1160, May 29, 1923, pp. 1-14).—An investigation under laboratory conditions as to the effect of a number of organic compounds as contact washes on *Aphis rumicis* L. occurring on plants of *Tropaeolum majus*.

The results are set out in two tables, which are discussed in detail. The compounds comprised the following groups: pyridene and allied compounds, alkaloids, amines and amides, aldehydes and ketones, alcohols, phenols, esters, organic acids and their salts, cyclic compounds and essential and fixed oils.

The alkaloids, with the exception of nicotine, were of low toxicity. Nicotine was the most toxic compound tested. Cresol U.S.P. was the most toxic of the phenols, and fish-oil soap (sodium base) was relatively ineffective. Essential and fixed oils showed some toxicity.

Neither the volatility nor the boiling point is a reliable index of the toxicity of organic compounds when used as contact insecticides.

Chemical structure does not appear to be a dependable index of toxicity, but it is probably the best empirical guide at present available for the study of contact washes.—G. F. W.

Isotrema chrysops Stapf (*Bot. Mag.* t. 8957; May 1923).—A climbing Aristolochia with sagittate leaves and yellow and scarlet flowers, from East Szechwan, at first called *Aristolochia heterophylla*, and hardy on a wall as far north as Edinburgh.—F. J. C.

Jasminum rex Dunn (*Bot. Mag.* t. 8934; Oct. 1922).—A Siamese species with simple glabrous, broadly oblong leaves and large white flowers. Requires stove treatment.—F. J. C.

States of America and includes Wilt (*Fusarium niveum* Eric Smith); Root-knot due to a nematode (*Heterodera radiculicola* (Greef) Müller); Gummy Stem Blight (*Mycosphaerella citrullina* (Smith) Gr.); Ground-rot (*Sclerotium rolfsii*); Anthracnose (*Colletotrichum lagenarium*); Stem End Rot (*Diplodia* sp.) and various minor diseases; Leaf spot (*Macrosporium*); bacterial wilt (*B. tracheiphilus* Ern. Smith); Mildew (*Pseudoperonospora cubensis* (B and C) Roston).

Various control measures include careful examination and selection of land, thorough spraying with Bordeaux mixtures, and in the case of stem-end rot disinfection of cut stems with a bluestone paste. Destruction of weeds and removal of all diseased melons are also suggested.—A. B.

Mesembryanthemum fragrans Salm-Dyck (*Bot. Mag.* t. 8937; Oct. 1922).—A yellow, large-flowered, sweet-scented species with thick green or grey (according to the season) leaves. Flowering in July. Native home unknown.—F. J. C.

Milletia dura Dunn (*Bot. Mag.* t. 8959; May 1923).—A tree of 30–35 feet, with Robinia-like leaves and pinkish-purple papilionaceous flowers in panicle racemes. Native of Ruwenzori, E. Equatorial Africa, and requiring warm-house treatment.—F. J. C.

Mosaic Disease of Potato and use of Certified Seed. By C. W. Edgerton and G. L. Tiebout (*U.S. Agr. Exp. Sta. Louisiana, Bull.* No. 181, August 1921, pp. 1–16).—The mosaic disease of the potato is the most important potato disease in Louisiana. Losses of 50 per cent. and more have been recorded. The appearance of the disease varies and depends upon the season, severity of the attack, and other factors. Two stages are recognizable, the curly leaf stage and the dwarf stage. The characteristic symptom is the leaf curl, and these leaves are usually lighter in colour than the normal leaves. The Bliss Triumph is particularly badly affected. The cause of the disease is at present unknown.

During the last few years certified seed potato have been put upon the market. These are varieties grown under careful conditions of culture, and though not actually immune are given a certificate of percentage purity. They are not necessarily free of disease, but the amount of disease is stated upon the certificate. Like ordinary varieties they should be sown and sprayed as required.—A. B.

Mosaic Diseases of Plants and Protozoa. By Ray Nelson (*U.S. Agr. Exp. Sta. Michigan Tech. Bull.* No. 58, Dec. 1922, pp. 1–30; 18 figs.). An intensive study of bean mosaic, clover mosaic, tomato mosaic, and potato leaf-roll, using modern cytological methods for fixing and staining *in situ* of protozoa, was made by the author. Definite protozoa usually in the sieve tubes and phloem parenchyma have been demonstrated to be constantly associated with these diseases. The bean and clover organism is a biflagellate elongated protozoon, apparently related to the Leptomanas. The organisms in mosaic disease of the tomato are related to the trypanosomas; the size varies from 6μ to 30μ in length and from $.5\mu$ to 6μ wide.

In the potato leaf-roll disease, organisms like trypanosomas have been found. All these organisms lie in a plane parallel to the long axis of the cell and are demonstrated in longitudinal sections only.—A. B.

Nematode Control, Hot Water Treatment for. By H. H. Zimmerley and H. Spencer (*U.S.A. Exp. Sta., Virginia, Bull.* 43, April 1, 1923, pp. 267–278; 6 figs.).—The results of experiments carried out to ascertain the best method of treating soil infested with the Root-knot Eelworm (*Heterodera radiculicola*) in glass-houses and frames where steam is available.

Several chemicals, e.g. formaldehyde, calcium cyanamide, sodium cyanide, and carbon bisulphide, were ineffective.

The best treatment was a midsummer application of boiling water at the rate of 5 gallons to the cubic foot of soil. The beds were divided into convenient lengths and the hot water was run on to them through $1\frac{1}{4}$ -inch piping, and, after the requisite amount was applied, the beds were covered with canvas.

A chart shows the soil temperature at various depths at the time and after treatment.—G. F. W.

Neuroptera, Notes on the Economic Value of the. By C. L. Withycombe (*Ann. App. Biol.*, vol. xi., April 1924, pp. 112–125; 1 plate).—This order is distinctly beneficial to man on account of the predaceous habits of its members.

Three families of economic importance are represented in Britain, viz. (i.) Coniopterygidae, (ii.) Hemerobiidae, and (iii.) Chrysopidae.

Descriptions are given of the principal species, together with short notes on their several life-histories, food, and plants on which they occur.

The chief beneficial larvæ are:—*Conwentzia psociformis* Curt., which prey upon small Rhynchota, e.g. Oak Phylloxera and mites, e.g. *Paratetranychus quercinus* Berl. (on Oak) and *Bryobia praetiosa* K. (on Pear); *Chrysopa prasina* Burm. is a valuable check upon Chermes on conifers, *C. tenella* Schn. and *C. septempunctata* Wesm. on the woolly Apple Aphis (*Eriosoma lanigerum* Hausm.), and *C. phyllochroma* Wesm. does valuable work in bean-fields, feeding on Bean Aphis (*Aphis rumicis* L.), while *C. flava* Scop. prefers larger Aphids, Jassids and Psyllids; and *Boriomyia subnebulosa* Steph. often feeds on the Bean Aphis (*A. rumicis*).

There are great possibilities of *Conwentzia psociformis* being used, in spite of heavy parasitism by species of *Lygocerus* and *Ceraphron*, for keeping "red spider" in check under glass. Confusion often arises from the similarity of these predaceous Neuroptera to White Flies (Aleurodidae), but this should not occur once the insects have been compared.

A bibliography containing 28 references concludes the paper.—G. F. W.

Nicotine Dust for Control of Truck-crop Insects. By Roy E. Campbell (U.S.A. Dep. Agr., *Farm. Bull.* 1282, pp. 3-24; 14 figs.).—Details are given as to the preparation, action, combination with other insecticides and fungicides, time and number of applications, and the various types of dusting machinery.

The following pests were successfully combated by a nicotine dust:—melon, cabbage, pea, bean, and rose aphides; bean and onion thrips; cucumber beetles, and the false chinch bug. The most satisfactory dust was one containing 2 per cent. nicotine, in the form of nicotine sulphate, mixed with a carrier, e.g. hydrated lime or kaolin.

The disadvantages are (i.) high cost, (ii.) volatility, (iii.) disagreeableness to inexperienced operators, and (iv.) it cannot be satisfactorily applied in windy or cold weather.—G. F. W.

Onion Diseases and Seed Production. By C. W. Edgerton (U.S.A. Agr. Exp. Sta., Louisiana, *Bull.* No. 182, pp. 1-20; 9 figs.).—The fungi attacking onions include *Macrosporium parasiticum*, *Peronospora schleideniana*, *Colletotrichum circinans*, *Botrytis* sp., *Fusarium malhi*, and other Fusaria. In Louisiana, the *Macrosporium parasiticum* is the most deadly disease, and this causes the stalks to turn black and rot. Spraying at weekly intervals has not given satisfactory results, but it is believed that to be effective spraying at shorter intervals is necessary.—A. B.

Ouratea flava Hutch. and Dalz. (*Bot. Mag.* t. 9023; Sept. 1924).—A West African shrub needing stove treatment. It has bright green leaves about 4 to 8 inches long, and terminal panicles of bright yellow flowers on bright red rachides. The sepals become bright red when the purple fruits ripen.—F. J. C.

Passion Vine, Sclerotina Rot. By W. A. Birmingham (*Agr. Gaz. N.S.W.* vol. xxxv. pp. 57-58; 1 fig.).—Inefficient drainage predisposes passion vines to attacks of *Sclerotina*. It appears as a white mould on the surface of the stem causing the bark to decay, and behind the bark a hard black body is formed. The diseased plant must be burnt, and freshly slaked lime should be applied to the soil.—S. E. W.

Peach Bud Rot (Fusarium Disease). By J. W. Roberts (*Jour. Agr. Res.* vol. xxvi. No. 10, Dec. 1923, pp. 507-511; 1 plate).—A species of *Fusarium* apparently identical with *Fusarium gemmiperda* (Aderhold) was isolated from dead peach buds in Georgia, U.S.A. The characteristics of this fungus are as follows: Fairly easily grown upon media (corn meal, potato agar, oatmeal agar, rice, prune agar, apple agar, glycerine agar).

Under conditions of extreme moisture the fungus causes a bud rot of the peach, sweet cherry, and sour cherry, and may cause considerable damage. Its distribution is not known.—A. B.

Peas, Fusarium Disease of. By F. R. Jones (*Jour. Agr. Res.* vol. xxvi. No. 10, Dec. 1923, pp. 459-476; 1 plate).—A very destructive stem and root rot disease of peas is caused by *Fusarium Martii* var. *Pisi*. The most susceptible part of the plant is the base of the stem just above the attachment of the seed. The fungus enters here and invades the vascular system and so causes wilting. High soil temperature (above 18° C.) favours rapid development of the disease, but variations in soil moisture within limits favourable for plant growth do not appear to favour its development.

A number of selected varieties of peas have been grown in infested soil which has been held under uniform controlled conditions to determine possible differences in resistance to disease. No marked differences in the resistance of the susceptible cortex have been found, but the vascular tissue beneath the parenchyma seems more resistant to invasion in certain varieties.—A. B.

Pentas coccinea Stapf (*Bot. Mag.* t. 9005; June 1924).—An undershrub needing stove or warm greenhouse treatment. It bears umbels of long-tubed scarlet flowers.—F. J. C.

Phellodendron Lavellei Dode (*Bot. Mag.* t. 8495; Oct. 1922).—Native of Japan. A rare tree in England, but hardy at Kew. Deciduous, the compound leaves becoming golden-yellow in autumn, and bearing clusters of round black fruits.—F. J. C.

Philadelphus Delavayi L. Henry (*Bot. Mag.* t. 9022; Sept. 1924).—A hardy species from China, flowering in mid-June with white flowers of good substance in terminal racemes. The plate does not do justice to the contrast between the almost black calyx and the white petals.—F. J. C.

Philadelphus sericanthus Koehne (*Bot. Mag.* t. 8491; Oct. 1922).—A Chinese species about 6 feet tall, bearing very pure white flowers abundantly. Henry described a pink form in Hupeh, but that is not in cultivation. Hardy, and with no special requirements.—F. J. C.

Philodendron teretipes Sprague (*Bot. Mag.* t. 9013; Sept. 1924).—A Colombian epiphyte which has been grown in the Masdevallia house at Glasnevin. It has an upright rich cream spathe with a crimson blotch.—F. J. C.

Photinia Davidiana Cardot (*Bot. Mag.* t. 9025; June 1924).—The plant usually called *Stranvaesia Davidiana*. A hardy evergreen shrub with corymbs of beautiful scarlet drupes in autumn. Nearly allied to *P. (Stranvaesia) undulata* and native of W. China, whence seed was sent by Mr. Forrest.—F. J. C.

Picea brachytyla Pritzl (*Bot. Mag.* t. 8969; August 1923).—A tree of 30 to 80 ft. from Western China, with slender branches and inch-long rigid mucronate leaves with two white lines on one and bright green on the other face, and dull brown cones, narrowly ovate, about 4 in. long. Probably hardy, but not yet sufficiently widely grown to be thoroughly tested; the best trees of this species are in southern England. It has been known by many names, as the synonymy indicates.—F. J. C.

Picea Glehnii Masters (*Bot. Mag.* t. 9020; Sept. 1924).—A Japanese forest tree, native in swampy river valleys and first sent to Europe by Maries in 1877, but still rare. Apparently likely to suffer from spring frosts while young, but probably hardy in age.—F. J. C.

Pieris taiwanensis Hayata (*Bot. Mag.* t. 9019; Sept. 1924).—A plant with the general aspect of *P. japonica*, but with numerous erect panicles of nodding white flowers. Native of Formosa and apparently hardy, although the flowers may be damaged by severe winter frosts. Flowering when quite small.—F. J. C.

Pimelea prostrata Willd. (*Bot. Mag.* t. 9010; June 1924).—A mat or cushion forming dwarf shrub from N. Zealand, which is apparently hardy in sheltered nooks in England. Both leaves and flowers are minute, but the latter are numerous and whitish.—F. J. C.

Plant Disease and Pest Control. By W. T. Horne, E. O. Essig, and W. B. Herms (*U.S.A. Exp. Sta., California, Circ.* 265, June 1923, pp. 1-104).—The first half of the bulletin is devoted to the description of insect pests and fungous diseases of crops, which are arranged alphabetically. Concise notes are given of the symptoms of attack and remedial measures.

Separate sections include general and physiological diseases, household pests, animal parasites, and rodents.

The final section gives formulæ and instructions for preparing insecticides and fungicides arranged under the headings of arsenicals, copper and sulphur compounds, petroleum and its distillates, carbolic-acid emulsions, tobacco preparations, vapours and miscellaneous washes.

The question of soil disinfection, heat as an insecticide, and weed killers conclude the paper.—G. F. W.

Plant Effects upon Reaction of Culture Solution. By D. R. Hoagland (*U.S. Exp. Sta. Cal. Tech. Paper* No. 12, Nov. 1923, pp. 1-16).—The author has devoted much attention to the study of the absorption of ions by various plants under controlled solution culture conditions, and his conclusions are summarized below. The reaction of a culture solution has an important bearing upon the absorption of ions by plants. The absorption of NO_3 ions was favoured by an acid reaction, and an increased absorption of cations occurred when an alkaline reaction was present. Observations of the effects produced on the reaction of various single salt solutions by growth of barley, peas and cucumbers showed that increased acidity occurred with ammonium sulphate, and chloride, potassium and sodium sulphates, and potassium phosphates. Light and temperature are important factors influencing the absorption of ions and change of reaction in culture solutions. KNO_3 in single salt solution causes injury to roots of peas, but not to those of barley. Allowance must be made for the rôle of CO_2 and HCO_3 ion in noting effects of plants upon the reaction of culture solutions.

The relationship between ion absorption and hydrogen ion concentration is discussed and the possible bearing of Loeb's work on proteins in this connexion.

Referring to the soil phase of the question, it is doubtful if the activities of the plant in the absorption of ions will directly bring about an increase of acidity in the soil. Soil extracts and displaced solutions show that during crop growth practically every trace of nitrate is removed from the soil solution. The cations are also reduced in concentration, and it is assumed that the bicarbonate ion is correspondingly increased in concentration similar to solution cultures.—A. B.

Plant Metabolism and Temperature Effects. By W. R. Tottingham (*Jour. Agr. Research*, xxv, No. 1, July 1923, pp. 13-30; 4 plates). A brief digest of the literature has shown variations of form and composition of plants in response to variations of climatic factors. In certain cases the decrease of temperature appears to be associated with the increase of polysaccharides in the plants. Such responses may have important relations to disease resistance in the organism.

The experimental evidence was based upon red clover and Buckwheat plants grown in two greenhouses at 15°C . and 20.6°C . average temperatures with constant soil water supply, but with 47 per cent. excess evaporation at the higher temperature and 44 per cent. excess of solar radiation at the lower one. Red clover under these conditions contained about 4 per cent. more of polysaccharides in the tops of the plants grown at the lower temperature than in the other case. Crude protein content of the plants was least at the lower temperature, but not in proportion to the difference of polysaccharides. Buckwheat grown in soil cultures with a uniform supply of soil moisture at average temperatures (atmospheric) of 17.5°C . and 22.8°C . with evaporation 7.2 per cent. greater at the higher temperature than at the lower one and with the reinforced solar radiation 3.6 per cent. greater in the latter case, contained 5.8 per cent. more starch in the seeds and 5.2 per cent. more polysaccharides in the stems at the lower as compared with the higher temperature. The nitrogen contents of the stems and leaves varied inversely as the polysaccharide contents. From this it would appear that atmospheric temperature modifies the percentage of polysaccharides in the tissues of the plants tested.

A full bibliography is appended.—A. B.

Plant Roots, Carbon absorption by. By J. F. Breazeale (*Jour. Agr. Res.* Nov. 1923, vol. xxvi, No. 7, pp. 303-312).—The conclusions arrived at were: The presence of NaNO_3 , or NH_4NO_3 , or the carbonates of calcium, sodium, or potassium in culture solutions for wheat seedlings is followed by the presence of carbonates in the ash of the plants. When sodium nitrate is present, the plants seem to absorb the NO_3 ion, leaving in the solution some sodium which combines with the water and with the CO_2 dissolved in the solution to form the carbonate or bicarbonate of soda. This in turn gives up its CO_2 to the plant. The plant can absorb CO_2 by its roots as an ion and exude CO_2 for the purpose of maintaining equilibrium in its tissues or in the nutrient solution.

Wheat plants do not seem to be able to absorb CO_2 from its solution in water without the presence of a soluble base. The absorption of a basic radicle (potassium) seems to depend largely upon the absorption of an acid radicle. The author thinks that the term "lime-loving," as applied to plants, might more properly be "carbonate-loving."—A. B.

Platanus digitata Gordon and P. cantabrigiensis Henry. By R. I. Lynch (*Gard. Chron.*, Oct. 11, 1924, pp. 250-1; 4 figs.).—Detailed descriptions of these two rare plants as grown at Cambridge Botanic Gardens.—E. A. B.

Podanthum floribundum Stapf (*Bot. Mag.* t. 8936; Oct. 1922).—Native of Asia Minor, hardy, but at present very rare, this perennial herb produces spikes of purplish flowers like those of some *Phyteumas*, to which it is nearly allied.—F. J. C.

Potato, Brown Rot. By F. C. Meier and G. K. K. Link (*U.S. Dep. of Agr. Circ.* 281, August 1923, pp. 1-6; 2 plates).—Potato Brown Rot is a bacterial disease (*B. solanacearum* E. Smith) which causes a wilting of the foliage. The vascular bundles become brown as the plant wilts and then show up as long black lines in the foliage. The bacterium seems to occur in certain virgin soils and attacks the roots and tubers, becoming located in the vascular bundles and are then carried to all parts of the plant.

It is not known definitely whether insects transmit the disease, but it would appear that leaf eating or puncturing insects can carry the disease. Isolated diseased plants should be destroyed by fire.—A. B.

Potato Crop and Borax. By B. E. Brown (*U.S.A. Dep. Agr., Bull.* 998, pp. 1-8; 4 plates).—The presence of borax in commercial fertilizers was the cause of damage to potato, cotton, and tobacco crops. Definite injury resulted to the potato crop when 5 lb. of borax per acre was applied to the furrow immediately before planting. When the fertilizer was broadcasted at the time of planting, or applied to the furrow some time before planting, injury was noted when 10 lb. of borax per acre was used. The borax hinders germination of the seed, kills the sprouts, weakens the plants, and causes poor yields.—S. E. W.

Potato Diseases in Michigan. By G. H. Coons and J. E. Kotila (*U.S. Exp. Sta. Mich., Special Bull.* No. 125, Dec. 1923, pp. 1-56; 48 figs.).—A general account of the commoner diseases of the potato found in Michigan, with suggestions for control and plant sanitation. It is divided into sections as follows:—

I. *Diseases controlled by spraying with Bordeaux mixture*: Late Blight (*Phytophthora infestans* (Mont.) De Bary); Early Blight (*Alternaria solani* (E. and M.)); Leaf Tip Burn (*Empoasca mali* Le B. (potato beetle)).

II. *Diseases controlled by treatment of seed tubers*: Potato Scab (*Actinomyces scabies* (Thax.) Güssow, formerly *Oospora scabies*); Black Scurf (*Rhizoctonia solani* and *Corticium vagum solani* (Bast.)); Wilt (*Fusarium oxysporum* Schlecht.); Black Leg (*Bacterium phytophthorus* Appel).

III. *Diseases controlled by use of high-grade seed tubers*: Leaf Roll (causal organism unknown); Mosaic and Streak; Giant Hill, Rugose Leaf, Dwarfs, and Spindling Sprout are all due to physiological causes.—A. B.

Potato Foliage, Degeneration Diseases of. By Alfred H. Gilbert (*Jour. Agr. Research*, vol. xxv, No. 6, August 1923, pp. 255-266; 6 plates).—In the cases of serious mosaic and leaf-roll infection germination of the seed tubers and growth of the shoots are markedly retarded. Marked variation in the progressive development of mosaic infection with differing strains of mosaic virus were noted in the germination of tubers of known ancestry. Spindling-sprout of the tubers is shown to be a constant symptom of leaf roll but not of mosaic.

Net-necrosis of the phloem is correlated in the tubers with spindliness of sprout and seems to be a constant symptom of leaf roll. The lack of apical dominance is not especially associated with the development of mosaic in the foliage.—A. B.

Potato, Fusarium Rot. By G. K. K. Link and F. C. Meier (*U.S. Dep. Agr. Circ.* 214, May 1922, pp. 1-9; 2 plates).—Fusarium tuber rot makes attacked tubers unsaleable and is marked by sunken, shrivelled or broken areas on the skin of the tubers. The underlying tissues may be dark brown or jelly-like, or soft cavities lined by moulds. Fusarium rot occurs in tubers from all potato-growing regions and readily spreads from field to field by wind, insects, birds and man. The fungus enters some wound in the skin or through the lenticels, and the spores readily germinate in presence of moisture and at a temperature between 34° F. and 102° F. Affected tubers should be disposed of as soon as possible and should not be sown or mixed with sound tubers.—A. B.

Potato, Late Blight. By G. K. K. Link and F. C. Meier (*U.S. Dep. Agr. Circ.* 220, May 1922, pp. 1-6; 2 plates).—This deals with *Phytophthora infestans* and its well-known ravages. The authors suggest that Bordeaux mixture (5-5-50) sprayed upon the plants will kill the fungus and that this is a very effective means of control, if it is done systematically and early enough before the disease becomes widespread.—A. B.

Potato, Osmotic Pressure of the Juices of the. By F. B. Lutman (*Jour. Agr. Res.* Nov. 1923, vol. xxvi. No. 6, pp. 243-256).—The present results confirm those obtained in 1918. The growing portions (leaves and branches) have a higher osmotic pressure in their cell sap than in the sap of the older leaves, stems, or new tubers. The stems usually show the highest pressure during the maximum activity of the plant (July 15 to August 20) because of the high percentage of reducing sugars present. Plants grown in tiles under a cloth shade have less osmotic pressure in the juices of the foliage leaves compared with plants grown in the open. The osmotic pressures in the stems and tubers are about the same in both. Mosaic plants have a higher osmotic pressure in the leaves than healthy ones, but this does not hold for the stems. The osmotic pressure varies much more between different parts of the potato plant than it does between the artichoke and dahlia. The potato is in a state of unstable equilibrium, but in the dahlia the pressure remains constant throughout.—A. B.

Potato Production in the South. By William Stuart (*U.S. Dep. Agr., Farm. Bull.* 1205, June 1921; 22 figs.).—The wide divergence of seasonal conditions in the South, coupled with a long growing period, makes it possible to plant and harvest potatoes in some localities in practically every month of the year. There are three distinct potato-crop seasons in the Southern States.—V. G. J.

Potato-Tuber Diseases, Control of. By M. Shapovalov and G. K. K. Link (*U.S.A. Dep. Agr., Farm. Bull.* 1367, pp. 1-37; 39 figs.).—The losses sustained by farmers and market gardeners through unsaleable diseased tubers are often so large that this bulletin aims at describing the symptoms of disease and avoidance thereof.

The general types of diseases are dealt with, the chief being those caused by (i.) ultra-microscopic organisms, (ii.) physiological means, and (iii.) fungi and bacteria, either internal or external parasites.

General measures of control are given, e.g. careful handling and storage, inspection of seed and soil treatment.

The several diseases are divided into groups: (i.) decays (7), (ii.) vascular diseases (3), (iii.) skin diseases and malformations (6), and (iv.) obscure and non-parasitic troubles (11). The symptoms are described shortly, and remedial measures are dealt with more fully.—G. F. W.

Potato Tuber, Studies on the. By E. Artschwager (*Jour. Agri. Res.* vol. xxvii. March 1924, No. 11, pp. 809-836; 10 plates).—Details of studies of the development of the potato tuber show that the periderm is formed jointly from the epidermis and hypodermis. Continuity of the periderm is assured by the development of a phellogen arising in the hypodermis.

The cortex forms a narrow band of tissue between the periderm and phloem groups. The cells contain pigment, tannins, and protein-crystals, with a small quantity of starch. The pith forms the narrow central core of the tuber but is continuous with the eyes by lateral branches. The cells contain but little starch and a higher water content than the rest of the tuber tissue.

The vascular tissue forms a narrow band of tissue of xylem and phloem. The protein crystals occur most abundantly in the peripheral cells of the cortex; the tannin vesicles in the region of the buds, especially at time of sprouting; the solania accumulates in great quantities in the buds. The phloem of the stolon occupies 24 per cent. of the area of the cross section, and this extensive development appears to indicate that this tissue is the most important channel for the translocation of organic substances.

A bibliography is appended.—A. B.

Potato Wart Disease (*Synchytrium endobioticum*). By F. Weiss, C. R. Orton, and R. E. Hartman (*U.S. Dep. Agr., Bull.* 1156, May 1923, pp. 1-22; 3 plates).—The paper is divided into three parts: the first part deals with the varietal and species hosts of this fungus; the second with the adaptability and use of immune varieties in Pennsylvania; and the third with the stability of wart immunity.

The varieties which are immune are 'Early Eureka,' 'First Early,' 'Flourball,' 'Irish Cobbler,' 'Early Harvest,' 'Extra Early Sunlight,' 'White Albino,' 'Burbank,' 'Bountiful,' 'Delaware,' 'Gold Coin,' 'Green Mountain,' 'Round Pinkeye,' 'White McCormick,' 'Dakota Red,' and 'Keeper.'

Most of the varieties of tomatoes are susceptible to the disease, but eggplant, tobacco, petunia, and pepper species are so far found to be immune.

The results of the adaptability tests of the selected wart immune varieties

would seem to indicate that these would be suitable for quarantined areas of Pennsylvania. Continued efforts, however, should be made to develop immune varieties of sufficient diverse types that one or more of these varieties will be available for commercial or private grower in every part of the State.

The stability of wart immunity was proved by the tests at Ormskirck, England, and an experience of three years with immune varieties in the United States is wholly confirmatory.

The immune varieties from England in 1919 showed in their first year a considerable proportion of leaf roll and mosaic mottling.

Further plantings in successive years showed further degeneration symptoms, but there was no loss of immunity from the wart disease in any of the English seed potatoes.—A. B.

Potatos, Degeneration Diseases of. By E. S. Schultz and Donald Folsom (*Jour. Agr. Research*, vol. xxv, No. 2, July 1923, pp. 43-118).—Several degeneration diseases (mild mosaic, leaf-rolling mosaic, rugose mosaic, streak, leaf roll, spindling tuber, curly dwarf) have been distinguished and transmitted in the 'Green Mountain' variety of the potato. Aphides (*Macrosiphum solanifolii* Ashmead) have transmitted mild mosaic and leaf roll and spindling tuber diseases. The mild mosaic virus diffuses from the inoculated leaves to the tubers in about ten days and shading tends to increase mosaic mottling, but tends to decrease leaf rolling. Proximity and much aphid infestation increases the spread of the mild mosaic.

Potato degeneration is largely and probably entirely a result of the increase of certain degeneration diseases.—A. B.

Potatos, Seed. By W. Stuart (*U.S. Dep. Agr., Farm. Bull.* 1332, pp. 1-17; 7 figs.).—To produce good seed potatoes, it is necessary to start with seed from a good productive strain, selecting tubers of uniform size and shape. It is a moot point whether whole or cut seed yields the best result. The seed is disinfected before planting. All rogues, weak and diseased plants must be eliminated from the growing crop.—S. E. W.

Potatos, Sterility of. By A. B. Stout (*U.S. Dep. Agr. Bull.* 1195, pp. 1-32, 8 plates).—The sterility of potatoes either may be due to non-blooming and abscission of buds which may be caused by environment, or it may be caused by the sterility of the pollen. Success in raising new varieties depends on the use of male kinds which yield the most fertile pollen. The setting of seed is facilitated by cool weather, and a moderate amount of moisture, especially at night.

Hybrids of *Solanum Fendleri* and *S. chacoense* bloom profusely but form no seed.—S. E. W.

Prickly Pear. By C. Brooks (*Agr. Gaz. N.S.W.* vol. xxxiv, pp. 493-496; 1 plate).—The cheapest method of destroying prickly pear is by dragging a heavy log over the infested area.—S. E. W.

Primula cardiophylla Balf. f. et W. W. Smith (*Bot. Mag.* t. 9018; Sept. 1924).—A stouter plant than *P. rotundifolia*, to which this is nearly allied. Native of the Himalaya, a plant with round leaves and bright pink flowers, the cultural requirements of which are so far unknown.—F. J. C.

Primula siamensis (*Gard. Chron.*, Oct. 18, 1924, p. 261; fig. 94).

Primula sinolisteri Balf. f. (*Bot. Mag.* t. 8939; Oct. 1922).—Nearly related to *P. obconica* but without the irritant properties of that greenhouse species, this was described in our JOURNAL 39, pp. 135, 142. It has pale pink flowers and is nearly hardy.—F. J. C.

Primula suffrutescens A. Gray (*Bot. Mag.* t. 8990; March 1924).—This N. American *Primula* has never been very common in gardens, although introduced in 1884. For particulars see JOURNAL R.H.S. vol. 39 (1913), p. 182.

F. J. C.

Prunes, Brown Rot of, Control for. By D. F. Fisher and Chas. Brookes (*U.S. Dept. Agr., Farm. Bull.* 1410, March 1924, pp. 1-12; 12 figs.).—Brown rot is found annually in the prune orchards of Lower Columbia, Pacific North-West States. In most years the losses are small, but when damp weather prevails there is a serious epidemic of this disease which may attack the blossoms as well as the fruit. Autumn and winter ploughing and good cultivation during the flowering season will greatly decrease the infection. Spraying the trees

before the blossoms open is very helpful in controlling this disease, but care must be taken with Bordeaux mixtures or lime sulphur washes because of the possible injury to the foliage of these fruit trees.—A. B.

Pruning Deciduous Fruit Trees. By W. le G. Brereton (*Ag. Gaz. N.S.W.* vol. xxxiv. pp. 509-518; 8 figs.).—As a rule the leaders of deciduous fruit trees should be topped annually until a suitable framework is established. It is safer to continue topping for a season too long than to cease topping a season too soon. Non-topping cannot be continued indefinitely. After some seasons, depending on the growth of the tree, topping must be resumed. As the cherry is subject to gumming, it should be left untopped as early as possible.—S. E. W.

Pruning, Leaf-time. By H. E. Durham (*Gard. Chron.*, May 24 and 31, 1924, pp. 309 and 315; with 3 figs.).—A useful exposition of summer pruning by a method of shortening at the fourth leaf when that is mature and later before leaf-fall to one leaf.—E. A. B.

***Prunus incisa* Thunb.** (*Bot. Mag.* t. 8958; May 1923).—A hardy shrub of 5-15 feet, allied to *P. nipponica*, from which it differs in its hairy petioles, and smaller, more finely denticulate eglandular teeth, as well as in the tubular calyx. Flowers with a rosy flush at the end of March before the leaves appear. Fruits very small, purple.—F. J. C.

Raspberry Blue Stem Disease. By R. B. Wilcox (*U.S. Dep. Agr., Circ.* 227, June 1922, pp. 1-12; 2 figs.).—Black raspberry plants are subject to a disease which causes "blue stems" in the canes in the Eastern States of America. The symptoms are a gradual stunting and reduction of vigour and a characteristic leaf curl where the midribs of the leaves are hooked or recurved. The curling is most pronounced on the younger leaves of the rapidly growing parts of the shoots. A constant symptom is the discoloration of the stems, which become blue in colour. This is due to the chlorophyll of the stem being attacked. The four common varieties ('Hoosier,' 'Cumberland,' 'Plum Farmer,' and 'Kansas') of raspberries are all susceptible, but the 'Kansas' variety is more resistant than the others. Wild blackberries are also susceptible to the disease.

For control, nursery stock free from the disease should be obtained, and any plants which have developed symptoms of the disease should be removed and destroyed. All sources of infection from wild blackberry canes should be carefully removed.—A. B.

Raspberry Diseases. By G. H. Coons (*Michigan Agr. Coll. Exp. Sta.*, vol. iv., pp. 138-141; 4 figs.).—Raspberries may suffer from anthracnose, cane blight, crown gall, leaf curl, and mosaic. In all cases eliminate and burn diseased canes. For anthracnose, spray with lime sulphur before growth begins, when the canes are 6 in. high, and again before flowering. There appears to be no cure for crown gall, cane blight, leaf curl, and mosaic. The two latter are spread by aphids, which must be checked by spraying with nicotine preparations.—S. E. W.

Raspberry, The Leaf and Bud Mite of. By A. M. Massee (*Jour. Pomology*, vol. iv., No. 1, July 1924, pp. 59-61; 1 fig.).—The occurrence of a mite, *Eriophyes gracilis* Nalepa, is recorded from the buds of thirteen varieties of raspberries, and 'Hornet B' is more susceptible to attack than any other variety that has been examined.

This pest causes some of the canes to dry up before blossoming, but the disease known as "blind canes" need not necessarily be the result of mite attack.

The distribution in Britain is given, specimens having been received from Kent, Surrey, Essex, Nottingham, and Scotland. The species is described and figured, and the life-history and habits are dealt with.

Mites are found in the buds, usually towards the apex under the bud scales, from September to May. The result of their presence is noted by the buds shrivelling and eventually drying out, and, occasionally, abnormal foliage.

In spring, when the buds open and the flowers form, mites may be seen moving about on the stem, flowers, and leaves, where eggs are laid during the spring and summer months.—G. F. W.

Resistance of Wheat to Rust Disease (*Puccinia graminis tritici*). By C. R. Hursh (*Jour. Agri. Res.* vol. xxvii. No. 6, Feb. 1924, pp. 381-412; 2 plates).—Differences in the properties of the cell sap of different wheat varieties are held to be one of the factors in increasing rust resistance. The proportion of sclerenchyma to collenchyma also appears to influence resistance, while obscure

physiological causes in the different wheat varieties are also important factors in resistance to this disease.

External morphological peculiarities, e.g. hairs on surface of plant, number, size, situation, and movement of stomata, must also have some influence in immunity from this disease. Further, these are modified by temperature, light, moisture, and soil nutrients. Some varieties are susceptible in the seedling stage, but immune in the field.—A. B.

Respiration of Leaves and CO₂ Content of the Atmosphere. By H. A. Spoehr and J. M. McGee (*Amer. Jour. Botany*, vol. xi. No. 8, pp. 493-501).—When the CO₂ content of the air surrounding a leaf is changed from a lower to a higher concentration, the leaf shows a reduced rate of CO₂ emission for a period following the change, then increases, and finally again attains about the same rate as before the change in CO₂ content was made. Conversely when the CO₂ content of the air surrounding a leaf is changed from a higher to a lower concentration, the leaf shows a primary increased rate of CO₂ emission and a subsequent decrease to the original rate. The intensity of this increased or decreased rate varies with different species of leaves, as does also the duration of the effect of the change.—A. B.

Rhipsalis Warmingiana K. Schum. (*Bot. Mag.* t. 8966).—An epiphyte from Brazil with pendulous branched angular or flat thin green stems and creamy-white flowers. It requires a warm house.—F. J. C.

Rhododendron apodectum Balf. f. et W. W. Smith (*Bot. Mag.* t. 9004; Sept. 1924).—A stout shrub up to 6 feet with broad elliptic leaves about 2 inches long. Flowers bright red about 2 inches long and 1 inch across the mouth, calyx large for the genus, bright red. Seed collected by Mr. Forrest in 1912. It is hardy but slow and perhaps apt to be damaged by too much moisture.

F. J. C.

Rhododendron Baileyi Balf. f. (*Bot. Mag.* t. 8492; Oct. 1922).—A small shrub with ovate leaves grouped near the tops of the branches. Flowers purplish-red, rather flat for a *Rhododendron*, about 1½ inch in diameter, in terminal clusters. Hardy at any rate in southern England. Seed collected in S. Tibet by Capt. Bailey.—F. J. C.

Rhododendron calostrotum Balf. f. (*Bot. Mag.* t. 9001; June 1924).—A dwarf species only a few inches high with small elliptical leaves setose on the margin and red beneath. Flowers rose-purple with few purple spots. Collected by Ward and by Farrer in Burmah.—F. J. C.

Rhododendron cantabile Balf. f. (*Bot. Mag.* t. 8963; May 1923).—A small shrub with oblong leaves about an inch long, scaly above and below. Flowers in close groups of about ten at the ends of shoots, purple, and about an inch across, flowering in July. Perhaps the best of the Lapponicum group, hardy in Cornwall and native in open alpine pastures of Yunnan, where Forrest collected it.

F. J. C.

Rhododendron planetum Balf. f. (*Bot. Mag.* t. 8953; Feb. 1923).—A shrub up to 9 feet from near Tachienlu. Related to *R. sutchuenense* and *R. calophyllum*, a plant with long, deep green leaves and trusses of rose-coloured flowers deeper without.—F. J. C.

Rhododendron ponticum, Present and Past Distribution of. By W. B. Turrill (*Gard. Chron.*, June 21, 1924, p. 378).—Relates the discovery of this plant in the Balkan Peninsula, and reviews its fossil records in Lombardy and near Innsbruck. Taken together with its known distribution in the Caucasus, Asia Minor, the Lebanon, Spain and Portugal, this throws fresh light on climatic changes and the distribution of plants.—E. A. B.

Rhododendron Searsiae Rehder and Wilson (*Bot. Mag.* t. 8993; March 1924). A species of the triflorum group collected by E. H. Wilson in Szechwan. Allied to *R. polylepis*, but distinguished by the bluish-glaucous hue of the lower leaf surface. Hardy and a strong grower, reaching a height to about 6 ft., and having widely campanulate flowers white edged pink, studded with light-green spots on the back of the wide throat.—F. J. C.

Rhododendron sinogrande Balf. f. et W. W. Smith (*Bot. Mag.* t. 8973; August 1923).—A native of China allied to *R. grande* and with magnificent foliage as much as 16 inches in length, green above and silvery below. Flowers large,

campanulate, white, fleshy, nodding, in large clusters. Collected by Forrest on Shweli-Salween divide, where it grows to a height of nearly 100 feet. Doubtfully hardy except in mild districts.—*F. J. C.*

Rhododendron sulfureum Franch. (*Bot. Mag.*, t. 8946; Feb. 1923).—A species with elliptic leaves about 2 in. long and close trusses of yellow bell-shaped flowers about 1 in. across. Native of Western Yunnan whence Forrest sent home seed. It grows in cane brakes and on the margins of pine forests.—*F. J. C.*

Rhododendron Williamsianum Rehder and Wilson (*Bot. Mag.* t. 8935; Oct. 1922).—A species collected on Wa Shan by Mr. E. H. Wilson, and at present very dwarf in this country. It requires well-drained, cool, and moist conditions, and produces large bell-shaped rose flowers in June. May be liable to damage by late frosts. A beautiful species.—*F. J. C.*

Rhododendrons. By F. Kingdon Ward (*Gard. Chron.*, April 19, 1924, p. 222 and in continuation).—This is a concise and valuable guide to the genus, mainly as regards garden value, but also deals with its classification, distribution, habits in nature, cultivation, hardiness and propagation so clearly that one could wish for its separate publication as a leaflet.—*E. A. B.*

Rhubarb, Crown Rot of. By W. A. Millard (*Leeds Univ., Bull.* 134, May 1924).—A soft brown rot attacks the crown of rhubarb, the bases of the stalks and leaf sheaths become discoloured, the foliage leaves become puce, and the terminal bud dies, the growth being weak from lateral buds. The disease is due to a bacterium now named *Bacillus Rhaponticum*. The infection is carried in the soil, but does not generally show itself until the second year. It is spread from the diseased plants by use of old roots as manure, by ploughing in refuse after cutting up roots for 'sets,' or by diseased plants littered on ground around forcing-sheds.

Ammonia is the only thing yet found effective against the pest, but soil treatment with liquid ammonia is both difficult and expensive, although refuse heaps might be treated with ammonia with advantage. Experiments are in progress to discover a substitute for liquid ammonia, carbonate of ammonia being suggested. No varieties have been found to be immune or resistant, and the disease is not restricted to any one locality.

As means of prevention clean farming is advocated, and the greatest care should be exercised in the purchase of disease-free stock.—*F. J. C.*

Root-knot, its Cause and Control. By G. H. Godfrey (*U.S.A. Dep. Agr., Farm. Bull.* 1345, pp. 1-26; 26 figs.).—The question of root-knot disease, caused by *Heterodera radicicola*, is dealt with in detail. The symptoms and the life-history of the eel-worm are described.

A list of fifty-eight plants subject to attack and twenty immune or only slightly susceptible plants is included.

The conditions favouring this disease are: (i.) light, especially sandy, soils, (ii.) soil with a temperature above 55° F., and (iii.) long, dry summers.

Other information includes the method of spread and control measures, under which heading appears steam sterilization, rotation of crops, hot-water treatment, avoidance of weeds and keeping infected land fallow for two years if practicable. The question of resistant varieties holds out great promise as to future preventive measures.—*G. F. W.*

Roots of Growing Plants, Liberation of Organic Matter by the. By T. L. Lyon and J. K. Wilson (*U.S. Exp. Stn., Cornell, Memoir* 40, July 1921, pp. 1-44; 9 figs.).—The object of these experiments was (1) to ascertain whether growing plants liberate organic matter, and (2) to determine at what stage of growth this takes place and its relationship to the absorption of nitrate nitrogen by the plant. Another object was to detect, if possible, the presence of reducing and oxidizing ferments in the nutrient solutions in which the plants were growing.

The plants (maize, oats, peas, vetch) were grown in large flasks (10-12 litres capacity) with nutrient solutions, the whole being perfectly sterile. At various stages of growth the plants were removed and analyzed for nitrogen and the nutrient solution tested for sterility and analyzed for nitrates, nitrites, ammonia, and organic nitrogen, also for total organic matter. The deposited matter at the bottom of the flasks was also tested for nitrogen. The nutrient solutions contained nitrogen only in the form of nitrate, but after several weeks' growth

of the plants organic nitrogen was always present. Determination of the total organic matter was made, and this was found to be large in amount compared with nitrogenous organic matter present.

The presence of reducing substances in solutions in which plants have been grown was indicated by various tests (e.g. with prussian blue solution and a trace of 0.5 per cent. solution of phenol). The tubes were allowed to stand 24 hours; and each tube of the unboiled solutions gave a distinct reaction. Boiled solutions and control tubes gave no definite test for reducing substances. Methylene blue, methyl violet, gentian violet, sodium selenite, and sodium tellurite gave no results.

Peroxidases were always present in solutions in which plants were grown, but the boiled solutions gave no reaction for them.

A short bibliography is appended.—A. B.

Rust, Crown, and Genus *Rhamnus*. By S. M. Dietz (*U.S. Dept. Agri. and U.S. Exp. Sta., Iowa, Bull. No. 1162*, Sept. 1923, pp. 1-18; 8 figs.).—*Rhamnus cathartica* L. is a commonly grown ornamental shrub in North Central and North Eastern States, and it has been found to bear æcidia of the crown rust (*Puccinia coronata* Corda) and be the cause of severe epidemics. Æcidiospores from *R. cathartica* caused infection nearly 1½ mile distant in seven days. In thirteen days infection had spread a distance of 53 miles.

Rhamnus lanceolata Pursh is widely distributed and also bears æcidiospores capable of infecting various grasses under field conditions. *R. caroliniana*, *R. alnifolia*, *R. Frangula*, *R. Smithii*, *R. Purshiana*, *R. californica*, and *R. crocea* are other species which may be liable to infection.—A. B.

Rust of Wheat, Effects of Fertilizers on the Development of. By E. C. Stakman and O. S. Aamodt (*Jour. Agri. Res.* vol. xxvii. No. 6, Feb. 1924, pp. 341-380; 3 plates).—Experiments extending over eight years were made to determine the effect of artificial and natural fertilizers on the development of wheat-stem rust. It would appear that the direct effect of fertilizers is slight, but there is sometimes a profound indirect effect. The effects of heavy nitrogen fertilizers decrease yield by increasing the proportion of straw to seed, and neither acid phosphate nor potassium can counteract the harmful effects of excessive nitrogen in some soils. The date of maturity, crinkling and shrivelling of the seed, percentage of yellow berry, and the yield of straw and grain are profoundly affected by different fertilizers.—A. B.

San José Scale (*Hoosier Hort.* vol. vi. pp. 44-45).—For controlling San José Scale a stock solution is prepared containing 1 gallon Diamond paraffin oil, 1 lb. potash fish-oil soap, and ½-gallon water. For use add to 50 gallons of water containing Bordeaux mixture 1½ gallons of the stock solution to make a 2 per cent. emulsion, or 2½ gallons for a 3 per cent. emulsion. The spray is applied when the trees are dormant.—S. E. W.

Satsuma Oranges, Colouring of. By R. C. Wright (*U.S. Dep. Agr., Bull.* 1159, pp. 1-22; 3 figs.).—Satsuma oranges are mature and palatable before the green skin changes to orange, but the public taste is in favour of the golden hue, and willingly pays a higher price for the richly coloured fruit. The golden-yellow colour can be imparted to the green oranges by exposing them for four days in a chamber into which the exhaust vapour of a gasoline engine is pumped for ten hours daily. Heat alone will not bring about the desired transformation.—S. E. W.

Schizophragma integrifolia. By C. L. (*Gard. Chron.*, Oct. 4, 1924, p. 231 and fig.).—This rare plant is so frequently confounded with *Hydrangea scandens* that this figure is useful.—E. A. B.

Schizophragma integrifolia Oliver (*Bot. Mag.* t. 8991; March 1924).—A Chinese representative of *S. hydrangeoides* from W. Hupeh and W. Szechwan distinguished by its larger almost entire leaves and larger flowers.—F. J. C.

Seedlings in Acid Solutions. By J. Davidson and E. T. Wherry (*Jour. Agri. Res.* vol. xxvii. No. 4, Jan. 1924, pp. 207-218).—The importance of the reaction (acidity or alkalinity) of the medium to plant life has long been recognized. Studies under field conditions have greatly increased in recent years due to the introduction of improved and delicate methods for estimating H ion concentration.

In the present paper, the conclusions arrived at were: Wheat seedlings were grown in solutions of HCl, HNO₃, H₂SO₄, H₃PO₄, HCOOH, CH₃COOH, (COOH)₂, and other acids, and the changes in reaction produced by their growth recorded at certain intervals.

Of the inorganic acids, the greatest changes were produced in nitric acid in the early stages of the growth of the seedlings and in phosphoric acid at the later stages. Phosphorus and nitrogen being the most essential elements of plant growth, it may be assumed that the changes in initial reaction were due to absorption rather than to neutralization.

The previous growth of seedlings in nutrient solutions deficient in acid-forming elements diminished their ability to decrease the acidity of the acid solutions. This is due apparently to functional disturbances in the seedlings.—A. B.

Soil, Action of Sodium Nitrite in the. By R. H. Robinson (*Jour. Agr. Res.* vol. xxvi, No. 1, Oct. 1923, pp. 1-8).—Sodium nitrite is rapidly decomposed in acid soils and the nitrite nitrogen lost. This nitrogen is, however, gradually lost in neutral soils and more slowly in alkaline soils. There is no oxidation of nitrites to nitrates under the conditions of the experiments. The addition of calcium carbonate and calcium hydroxide to the acid soils retards decomposition of nitrites, but does not aid nitrification of the nitrites. It is inadvisable to apply a fertilizer composed mainly of sodium nitrate to an acid soil.—A. B.

Soil Oxygen Indicated by Colour Changes in Alkaline Pyrogallol Solution. By Lee M. Hutchins and Burton E. Livingston (*Jour. Agr. Research*, xxv. No. 3, July 1923, pp. 133-140).—The roots of plants require free oxygen for their growth, and if deprived of it will not thrive and may die. The necessary rate of oxygen supply varies with the plant and with conditions of growth. The method of measuring the power of the soil to supply oxygen must fulfil two conditions: (1) oxygen must enter by diffusion; (2) the oxygen absorbed must be removed and collected in some efficient way. The apparatus used was a porous porcelain cylinder closed at one end and the pores filled with paraffin oil (*Nujol*). The cylinder was ground down to form a lateral wall 1 to 2 mm. thick, while the rim was coated with sealing-wax to prevent oxygen absorption. The open end of the cylinder was closed with a rubber stopper holding two glass tubes, one of which passed through the cylinder to the closed end, while the other terminated just inside the stopper. All joints were sealed with varnish. Oxygen diffused through the wall of the absorbing cylinder. Deoxygenated gas treated with alkaline pyrogallol was passed slowly (60 c.c. per hour) through the absorber, so that oxygen was removed from the cylinder as rapidly as it diffused in from the outside and then passed into an indicator bottle containing alkaline pyrogallol, which rapidly changed from a clear solution to finally a dark (opaque) solution as the oxygen was absorbed.

The results of these preliminary studies indicate that the oxygen-supplying power of the soil for a plant root becomes less (1) as the root lies deeper in the soil, (2) as the moisture content of the soil above the root increases, and (3) as the soil above the root becomes more firmly packed.—A. B.

Soil, Partial Sterilization of, by Antiseptics. By A. Matthews (*Jour. Agr. Sci.*, vol. xiv. Pt. 1, pp. 1-57, Jan. 1924).—The work described was carried out at Rothamsted during the years 1918-21 in continuation of the work begun by Russell and Hutchinson and carried on by Buddin. Comparison of the influence of various chemicals on soil organisms has led to conclusions which differ from those advanced by the authors mentioned above and are somewhat simpler.

Quantitative determinations were made of the effect on soil protozoa and bacteria of various antiseptic substances, including benzene and its homologues and derivatives, carbon disulphide, ammonia, formaldehyde, and chlorpicrin. Ammonia and nitrates were determined at the same time in many cases. The effect on fungi, eelworms, etc., was also determined roughly.

It was found that nearly all the substances disappeared from the soil fairly quickly. Usually the bacteria were reduced in numbers for the first few days, then rose to a maximum, and finally fell slowly towards normal. The whole fall was sometimes very slow, and the whole process was much slower in field soil than in the richer, lighter and better aerated greenhouse soils. The increase of the bacteria during the early days of an experiment varied in the same direction as the molecular weights and heats of combustion of the antiseptics and is attributed to the latter property. Naphthalene, for instance, which has a large heat of combustion, caused enormous rises, while benzene with its lower heat caused smaller rises. This rise was independent of the effect of the substance on the protozoa. Both naphthalene and toluene in large doses caused high rises; the first has no effect on the protozoa, while the latter kills all amoebæ and ciliates. Similar results were obtained when the experiments were made on soils already free from protozoa, such as a field soil which had been in bottle for 76 years, soil

in which they had been killed by steaming, and soil in which they had been killed by antiseptics. If the protozoa had been killed by a strong dose of a suitable antiseptic and the soil were then set aside for a long period, a second dose caused an even greater rise than the first.

It is therefore concluded that the rise in the number of bacteria is largely due to the feeding effect of the antiseptic on the bacteria and not only to the destruction of the protozoa, and that the increased fertility observed by Russell and Hutchinson is to be attributed in large measure to the activity of the greater bacterial population in breaking down the organic matter of the soil. Bacterial rises following treatment with lime or steam are similarly caused in part by the preparation of the plant residues.—A. S.

Soils Irrigated, The Movement of Water in. By C. S. Scofield (*Jour. Agri. Res.* vol. xxvii. No. 9, March 1924, pp. 617-694; 2 plates).—The present paper deals with various aspects of the alkali problem, which relates to the soluble salts in the soil solution. These salts only accumulate in arid soils where the evaporation exceeds the rainfall. In irrigated land, the soil acts as a reservoir to hold water for the use of the plants, but it has definite limits of capacity. These limits include the quantity within reach of the plant roots and the time required to fill it with water. A soil may hold as much as six inches of water for each foot of depth, but usually its net effective storage capacity is not much above two inches a foot of depth. The subsoil, usually more compact, may become saturated when it contains five inches or less a foot. The addition of one inch of water to a saturated subsoil may raise the level of the underground water as much as one foot.

The rate of penetration of water into a dry soil is influenced not only by the general texture of the soil, but more by the physical reactions of the soil material to water. Water added to a dry soil causes a perceptible change in colour, so that it is possible to observe and measure the rate of penetration in particular soils. The physical condition of the soil influences profoundly the movement of water through it. The composition of the soil solution is determined by measuring its more important constituents as ions and these include Ca, Mg, CO_3 , HCO_3 , Cl, SO_4 , NO_3 ions. The soil solution is constantly changing in concentration and composition. Its permeability to water is largely influenced by the bases present. When Na or K predominates, the soil is deflocculated and impermeable; when the earthy Ca and Mg are in excess, the soil is flocculated and permeable. When saline soils are leached to reduce the concentration of the soil solution, they become impermeable to water due to the alkaline bases combined with the soil causing deflocculation when the salts of sulphate and chloride of sodium are removed. Where the subsoil of an irrigated field is saturated with water, effective leaching of the soil is hindered by this accumulation of underground water. The injurious effects of sodium carbonate (black alkali) in irrigated soils appear to be due to the sodium rather than the carbonate, and this causes deflocculation and impermeability.

The readjustment of the relative proportions of sodium and other bases to an impermeable soil depends upon the replacing of the sodium with another base, e.g. calcium or aluminium, which brings about a flocculation and renders the soil permeable. A short bibliography is appended.—A. B.

Soils, Mineral, Active Bases and Acids in. By C. H. Spurway (*U.S.A. Exp. Sta., Michigan, Tech. Bull.* No. 57, Oct. 1922, pp. 1-28; 9 figs.).—The object of this research was to determine the neutralizing value of mineral soils for acids and alkalis by means of the hydrogen electrode and indirect titration. The conclusions were: when soils are treated with $\text{Ca}(\text{OH})_2$, the reaction proceeds slowly and comes to an equilibrium on pH 7.00 with the quantity of $\text{Ca}(\text{OH})_2$ required to raise the pH of soils to this point in at least 24 hours, but in excess of $\text{Ca}(\text{OH})_2$ no equilibrium is obtained. Lime water forms salts with acid soils. A soil acid equilibrium may be obtained in a short period of time with excess acid, and this equilibrium is quite constant for several days. Weak soil acids are given off when soils are treated with strong acids. The pH and base-acid ratio plotted as a curve corresponds to the normal hydrogen ion concentration curve obtained in weak acid-alkali titrations. The quantities of lime required to neutralize a series of different soils do not correlate with their degree of acidity. The base acid ratio in soils is of great practical importance.

A short bibliography is appended.—A. B.

Soils, On some Physical Properties of Transvaal. By B. de C. Marchand (*Jour. Agr. Sci.*, vol. xiv. Pt. 2, pp. 151-169, April 1924).—An endeavour has been made to correlate certain physical properties of soils with their texture with a view to the interpretation of mechanical analysis. It is shown that certain of

these properties can be roughly correlated with the clay content of the soil, but that the relationship is not sufficiently exact to be of much practical value. Marked differences were found in the properties of certain soils of similar clay content but of different origin and appearance. It would appear that comparison of all soils, without discrimination, on the basis of mechanical make-up, would lead to utterly erroneous conclusions. The value of mechanical analysis lies chiefly in its relation to genetic classification. This is particularly true in a country like the Transvaal, where the bulk of the soil is sedentary and large expanses of alluvial soil are unknown.—A. S.

Soils, Organic Matter in. By F. A. Carlson (*U.S.A. Agr. Exp. Sta., Cornell, Memoir 61*, Sept. 1922, pp. 1-28; 2 figs.).—A study of the effects of crops and treatment on the organic carbon and nitrogen in soils is recorded in this paper. The treatments included manure, potassium sulphate, and lime; the croppings consisted of a rotation without legumes, one with legumes, and permanent grass. The experiments extended over 8 and 10 years. An increase of organic carbon and nitrogen was recorded in the grass plots; but a decrease occurred in the plots without legumes. That with legumes showed naturally an increase in nitrogen, and this was more marked on those plots with lime than in those without lime. The results suggest that there is some relationship between organic carbon and nitrogen and the yields of crops. The crops in rotation with legumes removed more nitrogen from the soil than those without legumes.—A. B.

Spencera ramalana Trinien (*Bot. Mag. t. 9024*; June 1924).—See this JOURNAL, 49, p. 48. The editor of the *Bot. Mag.* alters the original spelling of the name *Spenceria* to *Spencera*.—F. J. C.

Sphaeropsidales, Pycnidium formation in some. By L. H. Leonian (*Amer. Jour. Botany*, vol. xi. No. 1, Jan. 1924, pp. 19-50).—Some twenty species of the *Sphaeropsidales* (including *Phyllosticta opuntiae*, *Phoma urens*, *Endothia parasitica*, *Vermicularia circinans*, etc.) were experimented with some factors as light, temperature, oxygen, and food concentration. A summary of the results is herewith appended. On exclusion of light two organisms failed to form pycnidium, twelve showed reduced formation, while six were not affected. Temperatures of 30°C. induced a better formation of pycnidia in spite of the absence of light, while a temperature of 8°C. inhibited their formation in nine organisms. Decreased supply of oxygen suppressed fruiting in three organisms, reduced it in eleven, while six remained indifferent. When submerged eight organisms fruited as well as on the surface, three formed pycnidia, but the spores did not mature, while nine fruited on the surface of the nutrient solution only. The sudden complete withdrawal of food from a mycelium grown in a rich solution is not conducive to better reproduction. It was found that a sudden increase of food concentration in a more dilute solution was most favourable to pycnidium formation. Osmotic pressure is not a factor in growth or reproduction of these organisms. Richly fed mycelium, when starved for a period, gives rise to great numbers of fruit bodies.—A. B.

Spinach: Handling for Long-distance Shipment. By V. W. Ridley (*U.S. Dep. Agr., Farm. Bull. 1189*, Feb. 1921; 9 figs.).—Careful handling must begin in the field. Slightly wilted plants can be handled with less damage than crisp ones, but excessive wilting must be avoided.—V. G. J.

Spray Fluids, The Physics of. (1) The Properties of Wetting and Spreading. By R. M. Woodman (*Jour. Pomology*, iv, No. 1, July 1924, pp. 38-58; 6 figs.).—This paper deals with the physics of liquids in relation to their wetting and spreading properties, and points out that these terms are not synonymous.

Comparisons were made between a smooth leaf surface and glass and wax surfaces by a method which is fully described.

Wetting depends upon reducing the surface tension of the liquid by the addition of small quantities of soap. There is a critical surface tension, which failure to reduce to this point results in imperfect wetting and insufficient retention by the leaves. A 0.3 per cent. gelatine solution was found to wet the leaves thoroughly, caused greater viscosity, and augmented the amount of spray retained.

Spraying with force increases the amount of liquid retained by the leaves.

The best and cheapest "spreader" was soap, and small drops of a soap solution applied with great force are likely to spread over the leaf surface to the greatest extent possible.

The several conclusions arrived at are explained by means of graphs.

G. F. W.

Stapelia tsomoensis N. E. Brown (*Bot. Mag.* t. 8940; Oct. 1922).—A native of the Transkei, this plant presents the usual features of the genus, although the odour of the flowers is not very strong. It has bright purple-brown flowers about 2 inches in diameter fringed with purple hairs, and green on the back.—F. J. C.

Stem Nematode, *Tylenchus dipsaci*, on Wild Hosts in the North-West. The. By G. H. Godfrey and M. B. McKay (*U.S.A. Dep. Agr., Bull.* 1229, March 1, 1924, pp. 1-9; 1 fig., 3 plates).—The stem eel-worm has been found in great abundance on the wild strawberry, *Fragaria chiloensis*, and false dandelion, *Hypochaeris radicata*, in the Pacific North-West.

The symptoms and distribution are described, together with the apparent independence of the two hosts, relation to environment, origin, disseminations of the disease, and inoculation experiments.

On either host the symptoms are similar, i.e. swelling and crinkling of the stem and leaves, resulting in severe twisting and bending. In severe attacks the plants are killed. In strawberry plants the stolons and flowering parts are swollen and distorted.

Inoculation experiments with the strawberry strain showed that it can be successfully transmitted to *Fragaria vesca*, *F. virginica*, and *F. platypetala*, and to red clover seedlings. Attempts to transmit the *Hypochaeris* strain to other hosts have so far failed.—G. F. W.

Strawberries, Spraying of, for Control of Fruit Rots. By E. M. Stoddard, D. H. Rose, and N. E. Stevens (*U.S. Dep. Agr. Bur. Pl. Ind. Circ.* 309, March 1924, pp. 1-4).—The strawberry is one of the most perishable of fruits grown in the United States, and therefore one of the most difficult to control by spraying. The loss from this fruit alone in the States runs into several thousand dollars annually. The present tests represent the first attempt to control fruit rots in strawberries.

The spraying dusts used—a copper lime-dust with 15 per cent. dehydrated copper sulphate and 85 per cent. of lime, and a dusting sulphur with 93 per cent. sulphur—were applied with a hand blower. Five applications were made as follows:

Spray, March 10, 15, 26; April 10 and 20.

Dust, March 12, 17, 27; April 7 and 20.

A table of results is appended which shows that 75 per cent. of those sprayed against 63 per cent. untreated were sound four days after picking; and in another case 81 per cent. of those sprayed against 71 per cent. unsprayed were sound four days after picking. It is proposed to extend these tests in future years.—A. B.

Sugar-Beet Nematode, The, in the Western States. By Gerald Thorne and L. A. Giddings (*U.S.A. Dep. Agr., Farm. Bull.* 1248, pp. 3-16; 10 figs.).—The history, distribution, and life-history of *Heterodera schachtii* Schmidt are dealt with in a popular manner.

A useful table shows the distribution of this eelworm at depths varying from 1 to 30 inches during July, August, September, October, and November. The greatest number were found at a depth of 5-6 inches during September, and a few were found at a depth of 30 inches.

The determination of infestation is given, together with information regarding how the soil becomes infested and methods of control.—G. F. W.

Sweet Potatoes, Classification of. By H. C. Thompson and J. H. Beattie (*U.S.A. Dep. Agr., Bull.* 1021, pp. 1-30; 7 plates, of which 4 are coloured).—The 40 varieties of sweet potato grown in the United States may be arranged in 8 groups, determined by the character of the vines, shape of leaves, size, shape and colour of the roots.—S. E. W.

***Symphytum grandiflorum* DC.** (*Bot. Mag.* t. 8494; Oct. 1922).—A hardy perennial from the Caucasus with cream flowers and pink buds, not demanding sun, flowering from March to June.—F. J. C.

***Thryptomene thymifolia* Stapf** (*Bot. Mag.* t. 8995; March 1924).—A glabrous aromatic shrub with heath-like leaves and small white flowers, native in W. Australia.—F. J. C.

Tobacco Wash. By A. A. Ramsay and E. L. Griffiths (*Agr. Gaz. N.S.W.* vol. xxxv. pp. 295-297).—A wash prepared by extracting 2 lb. of tobacco dust with 3 gallons of water to which 7 oz. lime is added does not go mouldy like the extracts made without lime.—S. E. W.

Tomato Black Rot (Phoma). By G. K. K. Link and F. C. Meier (*U.S. Dep. Agr., Circ.* 219, May 1922, pp. 1-6; 1 plate).—This circular deals in a popular way with the symptoms and control of the Phoma destructive disease of the tomato. It attacks the green and ripe fruit, making them unsaleable.

No satisfactory effective measures for the control of the disease in the field have been determined, but crop rotation and use of disease-free seed are advisable.—A. B.

Tomato Production in California. By J. T. Rosa (*U.S. Exp. Sta., California Univ. Circ.* 263, pp. 1-19, 5 figs.).—The favourite varieties of Tomato are 'Earliana,' small fruit and weak vines; 'Bonny Best,' with larger fruit, round and red; 'Livingston's Globe,' a second early. 'Stone' is a late variety, suitable for canning and export. 'Norton' is an improved 'Stone,' resisting *Fusarium Wilt*. 'San José Canner' is a late sort, a heavy bearer suitable for canning and export. 'Morse's San José Canner' is an improved variety of the above. Failure to set fruit is caused by too much nitrogenous manure and by too abundant supply of water. A very dry atmosphere tends to prevent the fruit setting.—S. E. W.

Tomato Wilt and Resistance Tests. By C. W. Edgerton and C. C. Moreland (*U.S. Agr. Exp. Sta., Louisiana, Bull.* No. 184, Nov. 1921, pp. 1-24; 8 figs.).—The wilt disease attacks all tomato varieties, but it kills the susceptible plants more quickly than the resistant ones. The causal organism is *Fusarium lycopersici*. Wilt development is much slower in resistant varieties during the early part of the season, while the plants are growing vigorously, than it is in susceptible varieties. Many commercial varieties of tomatoes are very susceptible. The best resistant varieties to the wilt disease in Louisiana are the 'Globe,' 'Norton,' 'Marvel,' and 'Manyfold.'—A. B.

Tomatos, Development of Wilt-Resistant. By Fred J. Pritchard (*U.S.A. Dep. Agr., Bull.* No. 1015, March 1922, pp. 1-18; 10 plates).—Tomato wilt disease (*Fusarium lycopersici*) causes an annual loss of more than 115,000 tons of tomatoes in the United States. The writer has developed three varieties of tomatoes which are highly resistant to the wilt fungus. These are 'Greater Baltimore,' 'Stone,' and 'Marvel of the Market,' which also possess excellent cropping qualities. The 'Duke of York' and the 'Buckeye State' (one variety under two names) are highly resistant, but they produce poor fruit.

Tomato plants selected for wilt resistance usually transmit to their offspring as much resistance as can be developed from them by subsequent selection.—A. B.

Tomatos, Frost Injury of. By R. B. Harvey and R. C. Wright (*U.S.A. Dep. Agr., Bull.* 1099, pp. 1-9).—Tomatos are liable to injury by frost during transit by ship or train in winter. They freeze about 30-46° F. The thick-skinned varieties resist cold better than the thin-skinned.—S. E. W.]

Vanda Hookeriana (*Gard. Chron.*, Oct. 11, 1924, pp. 245-247).—Two figures of this rare orchid as it flowered at Tring.—E. A. B.

Veronica canescens T. Kirk (*Bot. Mag.* t. 9003a; June 1924).—A creeping perennial with very small hairy leaves and small lilac-blue flowers, native of S. Island, N. Zealand. Apparently hardy.—F. J. C.

Veronica pimeleoides Hook. f. (*Bot. Mag.* t. 8967).—A dwarf shrub about 15 in. high, with hairy purple stems and ovate glaucous-green entire leathery leaves. Flowers in axillary spikes, bluish purple, stamens purple. Hardy in sheltered places. Native in dry places in S. Island, New Zealand, at 1,000 to 3,000 ft. altitude.—F. J. C.

Viola elegantula Schott (*Bot. Mag.* t. 9021; Sept. 1924).—This is the plant often grown on rock gardens as *Viola bosniaca*. It is related to *V. declinata*, but besides differences in the leaves and stipules has reddish-violet flowers with a golden-yellow eye marked with radiating black lines.—F. J. C.

Vitamines and Development of Yeasts and Moulds. By W. Lepeschkin (*Amer. Jour. Bot.*, vol. xi. No. 3, March 1924, pp. 164-167; 1 fig.).—It is well known that yeasts contain vitamins which have an accelerating effect upon various physiological functions of animals. The author decided to test if those vitamins were necessary for the life and the growth of the yeast itself.

Pure cultures of *Sacchomyces cerevisiae*, I. Hansen, were used, and single cells

were placed in a drop of the culture solution containing $(\text{NH}_4)_2\text{SO}_4$ as the source of nitrogen and others containing peptone. No development of the yeast occurred in the first, but an excellent development took place in the second culture drop. Further experiments were made with drops containing small quantities of Vitamine B., and it was shown that not only was the rate of fermentation of the yeast greatly increased but also the rate of growth was equally marked.

Sclerotinia cinerea could not grow without the addition of fruit juices, or extract of yeast to the culture solutions. With *Penicillium glaucum* the effect of the vitamine was similar to that produced by the yeast. The author thinks that the cause of the effect of the vitamine may be due to the co-enzyme in the fermentation process on a kind of catalytic process.—A. B.

Walnut Roots and Hydroxyl Ion Concentration. By H. S. Reed and A. R. C. Haas (*Amer. Jour. Botany*, vol. xi. No. 2, Feb. 1924, pp. 78-84; 4 figs.).—Repeated observations have shown that Persian Walnut trees (*Juglans regia*) are very sensitive to alkaline conditions. The object of this work was to determine whether the injurious effects upon roots of walnut trees were due to high concentration of the hydroxyl ions or to calcium starvation. It was found that seedlings may be grown in a solution of a single calcium salt, but they perish quickly in a solution without calcium. Walnut seedlings have been grown successfully for periods of one week in solution of calcium hydrate (pH 9.0 and higher). Therefore it would appear that the injury to walnut roots from solutions of high pH values is to be ascribed principally to calcium starvation rather than to the effect on the plant of high concentration of hydroxyl ions.—A. B.

Walnuts, Mouldy. By L. D. Batchelor (*U.S. Exp. Sta., Berkeley, California, Bull.* 367, pp. 677-696; 1 col. plate).—The chief agent in turning Walnuts mouldy is the fungus *Alternaria*. Other fungi are also found occasionally, viz. *Penicillium*, *Cladosporium*, *Fusarium*, *Macrosporium*, *Mucor*, and *Sclerotinia*. Seedling trees yield a larger proportion of mouldy nuts than the budded varieties. This is due to the fact that budded trees drop their nuts free from husk, whereas the husks adhere to the nuts when falling from the seedling trees. The percentage of mouldy nuts increases towards the end of the season. To check the growth of mould and to prevent discoloration of the kernels, water the trees in summer to prevent the leaves falling, and hasten the harvesting of the nuts. Do not allow the nuts to lie on the ground longer than can be helped, and remove the husks from the nuts. Grade the crop.—S. E. W.

WaterMelons. By W. R. Beattie (*U.S. Dep. Agr., Farm. Bull.* 1394, pp. 1-22; 12 figs.).—If possible Water Melons should be planted on new land, and should not be grown on the same plot more than once in ten years. The use of manure from stock fed on refuse melons or hay from melon fields is a frequent source of disease. Rich, sandy soils are best for their cultivation, but good crops are raised on any well-drained, warm, and fertile land. Applications of farmyard manure and artificial fertilizers containing nitrogen 5 per cent., phosphoric acid 10 per cent., potash 5 per cent., at the rate of 620 lb. per acre are essential. When all danger of frost is over the seedlings are planted out in hillocks (10 feet by 10 feet). Melon Aphis and Striped Cucumber Beetle are controlled by dusting with nicotine preparations; *Fusarium* Wilt and Root-knot are avoided by planting on new ground; Anthracnose and Stem-end rot are checked by the use of Bordeaux mixture and other copper preparations.—S. E. W.

Wattakaka sinensis Stapf (*Bot. Mag.* t. 8976; August 1923).—A climbing Asclepiad with black-bryony-like leaves and small white, pink-spotted flowers in axillary umbels. The plant is grown on a wall at Aldenham.—F. J. C.

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HEDGES.

By CHARLES ELEY, M.A., F.L.S.

"Is there *any* thing whereof it may be said, See, this *is* new? it hath been already of old time, which was before us."

This quotation, from a source that it is at least unwise to dispute, may awaken a repudiating echo in youthful minds, yet at any rate the elders know that not a few old things are forgotten only to arise again and be proclaimed as discoveries, of which, in truth, the appearance alone is new. Perhaps it was some such resurrection—always tedious to the experienced—that provoked to a semblance of petulance that preacher from whom the quotation is drawn. This reflection may serve, on the writer's part, as a disclaimer of any pretension to announce discoveries, but to some extent hedges would seem to have been long enough forgotten in many quarters to entitle them to the honour of a revival; presumably the Editor must share this opinion or he would hardly have been prompted to ask me "to say a few words" about hedges. Yet the writer has made one discovery. A great authority sat one baking hot day and gazed thoughtfully upon a yew hedge, by no means an ancient hedge but just good and well cared for; at length he broke silence and in drowsy tones remarked that now he realized why, in "Gardening for the Twentieth Century," I had declared a yew hedge to be the backbone of many English gardens. It did seem a discovery that so good a judge as this one should even for a moment have forgotten the value of hedges and require the resolute beauty of that hedge to recall to him their importance. This episode

suggests that there may be many people who have forgotten the use and so condone the neglect of hedges as barriers, boundaries, or objects of great beauty ; moreover the admiration with which a good hedge is often greeted makes it at least credible that there are good gardeners who have never given to hedges more than a passing thought, and in whose minds hedges, like the boot-boys in well-ordered establishments, are expected at small cost to be the willing servants of everybody, but of whom neither the efficiency nor the cleanliness is severely criticized ; yet frequently the virtues of wild hedgerows and of little boys—not of the “boots” variety but *ferae naturae*—are proclaimed without complete justification.

Hedges are needed either as boundaries, as screens, or solely as objects of beauty, and of course it is well to combine utility and beauty as much as possible. A poet has declared his “trust in Nature for the stable laws of beauty and utility,” but even Nature is not proud enough to disregard all help. Utility shall have precedence.

The number of first-class plants that will provide a sound and safe defence against live-stock is small. The best is certainly common thorn (*Crataegus monogyna*) ; it will thrive in almost any soil, and possibly was called “quick” because it rarely dies, no matter how brutal may be the mistreatment of it. “Quick” with little care is quite impenetrable and can be well kept at almost any reasonable height—either tall or quite low. When replacing an old hedge it is never advisable to use again the same species, and this is particularly dangerous in the case of thorn, as is shown by the old warning never to put “quick on quick.”

Beech (*Fagus sylvatica*) is sometimes mixed with “quick” when the hedge is made ; the planter thereby gets two strings to his bow, and, all being well, the pleasure of patches of brown beech leaves in winter. But the result of the mixture is necessarily somewhat patchy in appearance, and since “quick” is so accommodating it is certainly best to plant it pure. Where beech does well, and this is on all medium land and in particular on chalky soils, it would be difficult to make a better selection. It grows very rapidly, is stiff enough for all purposes, and is an amazingly beautiful sight during the winter, since its rich brown leaves—long retained—produce a deliciously warm contrast to chilly surroundings. On heavy soils, e.g. London clay, hornbeam (*Carpinus Betulus*) will be found an efficient substitute for beech, and when suited as to soil forms a denser hedge than beech and is less liable to get thin with age ; it does not struggle so much to become a forest tree of the largest size as naturally is the case with beech. Hornbeam has been described as “a rigid tree of humble growth,” and is extremely patient of the knife. All the same, single specimens will attain a height of seventy feet. From earliest times hornbeam has been a favourite plant for forming hedges, and the fact that it appears to be less planted than formerly is only one more instance of prevalent distaste for “the wisdom of our ancestors.” In short, except that its leaves in autumn turn yellow instead of brown (they also are long

retained) it is preferable to beech as a protection against live-stock as being so rigid in habit and so responsive to clipping.

Should fancy demand an evergreen hedge, the only plant for the purpose under discussion is holly (*Ilex Aquifolium*), though, of course, a selection can well be made from amongst its many and greatly varying varieties; but it should be borne in mind that holly does not readily thrive in cold, stiff soil and that rabbits are fond of it. Large plants can be obtained and a hedge thus rapidly attained—if expense is no object; it is however necessary to be certain that they have been moved regularly. In the long run it is best to use quite small seedling plants and to keep them clean. In every case a temporary fence, for choice one that is easily removable, must be erected until the young hedge is capable of full duty, and with small hollies this means waiting several years. There are, no doubt, several other plants that will serve as barriers against stock; for instance, the blackthorn (*Prunus spinosa*) and the cherry plum (*Prunus Myrobalana*). But the former is slow in growth—no pun is intended—and in time is liable to sucker inconveniently; while the latter makes somewhat too soft a hedge, at any rate until long established, though it can be used to “thicken up” hedges of “quick” that have become thin or where for good reason it is believed that “quick” would fail. Cherry plum grows rapidly.

So much for hedges of strictly useful type; but it must be remembered that such good servants deserve and will well repay the same good treatment as should be given to those for ornament or shelter *within* the garden, though the former class may not need quite such scrupulous care.

Within the garden, hedges are required for shelter, for division, and for ornament. Ornament is, as regards the well-being of a garden, really the least important of these three functions; it is, however, the one that is most commonly considered first. It is difficult to over-estimate the value of the shelter afforded by hedges in gardens, and this applies not only to the garden plants but also to the human beings who enjoy the garden; many a walk on cold and windy days in spring or autumn is made enjoyable by the friendly shelter of a hedge, and the mere realization of enjoying a cosiness denied to those outside is an added joy. Everyone values a sheltered walk; far too few consider the provision of shelter in their gardens. If plants could talk they would say enough about it! Comfort for all concerned should never be neglected anywhere. But perhaps this amounts almost to digression.

The garden plant (it is too poisonous to live-stock for use on boundaries) that in the highest degree will provide the three requirements—shelter, demarcation, and ornament—is yew (*Taxus baccata*). It is doubtful if anyone who has seen a good yew hedge would gainsay this, but many are inclined to say that it grows too slowly in view of the brevity of life and leases: this idea, so prevalent, is a delusion. Yew does not hesitate to grow vigorously if small seedlings are planted in ground that has been trenched both deeply and widely; they must

be kept clean and liberally treated to manure when once they have got going. A handful of nitrate of soda mixed with sand and applied when the soil is damp in April, May, and June will work wonders, but care must be taken not to dust the mixture too close to the stem. A single leader should be maintained and the plants pruned just enough to promote stiff side-growth. Thus it will be soon apparent that gratitude, sometimes said to be rare amongst "the noblest work of God," is accorded generously enough by some of the more humble works of the Creator.

The shape of hedges is of the utmost importance, and the following remarks apply to all hedges. Care must be taken to keep the plants wider at the base than at the top; this treatment allows uniform access to the light and so prevents the appearance of the gaps that so frequently disfigure, almost destroying the beauty of hedges. A section of a hedge, throughout all its stages, should show the form of a blunt-headed triangle or a capital A.

Yews will thrive on almost any soil (including damp and heavy), but, of course, on poor land it is advantageous to feed them liberally after establishment and until the required height has been reached.

If yew be placed first amongst garden hedge plants, then undoubtedly the holly (*Ilex Aquifolium*) comes second; many good judges would place it first. But holly never produces that "finished" appearance that one associates with a perfect yew hedge; the demeanour of holly is more cheerful, but it lacks that severity which makes yew so attractive as a boundary. Holly does not, like yew, accommodate itself to cold, stiff soil. The necessary clipping, both of yews and hollies, should be done at midsummer; in most places holly transplants best at the end of September or early October, in fact as early in the autumn as the soil may be sufficiently damp to tempt the venture and while the earth is still warm from the sunshine of summer. The big-leaved green varieties make glorious hedges, and if, after consideration, it is decided that a gold or silver variety is desirable, then "Gold Queen" and *I. Aq. var. argentea marginata* will be found to be the fastest growing of those which are easily obtainable.

Box (*Buxus sempervirens*), or one of its fairly rapid growing varieties, makes a good hedge and is particularly useful where the soil is damp and shady; but it dislikes hot soil, and often after being moved shows resentment by turning a rusty yellow colour, and continues so for some long time in spite of coaxing. When a really big hedge or screen is required there is no plant that equals the holm-oak (*Quercus Ilex*) which in vigour of growth will be found to equal Scots pine (*Pinus sylvestris*), even though the latter may appear to be getting the better of the race in the first few laps. Small plants from pots should be used; for *Quercus Ilex* does not move well.

Such conifers as *Thuja plicata*, *T. occidentalis*, *Cupressus macrocarpa*, or any of the Lawson cypresses will give a rapid return for the outlay; but such sudden joys are "too exquisite to last," and before very long the plants tend to get bare at the bottom, patchy at the

sides, and are often blown over. Necessary clipping of such trees should be done in April. When wisdom does dictate the use of such short cuts to happiness it is well to plant the conifers in front or behind a good young hedge and to remove the conifers as soon as the hedge has got big enough.

Oval-leaved privet (*Ligustrum ovalifolium*), which is invaluable in shady or smoky places, and *Euonymus japonicus* both make useful hedges, but both have been used to excess, and the latter is prone to a disfiguring disease.

A soft hedge of rapid growth, especially near the sea-side, that stands clipping well (this it requires at least twice a year) can be formed with *Lonicera nitida*, a Chinese shrubby honeysuckle found by Mr. WILSON in W. Szechuan and in Yunnan. It is a plant of charming habit; it never fails to attract attention; and so far it has proved to be quite hardy. This seems a suitable place at which to warn the innocent against the danger of planting recent introductions from China (or anywhere else) in situations where their duty is of vital importance. Vital is the correct adjective to use, because at present not enough is known about the hardiness of such plants. When, as would appear due, this country is again engulfed by such a winter as swept over the British Isles in the mid-nineties, we shall know more! Meanwhile it will be wise to use with caution plants from Yunnan, and to prefer for "permanent" planting those from Hupeh and Szechuan.

Berberis stenophylla is a first-class hedge plant, especially where it can be allowed a certain amount of freedom, but it clips quite well and as a hedge is far superior to the more showy *Berberis Darwinii*, that is liable to get leggy and is by no means very amenable to shears. *Escallonia macrantha* forms a superb hedge and is the "standing dish" in the West; if given a dry situation it is not nearly so tender as is commonly supposed. The narrow-leaved bay (*Laurus angustifolia*) and *Phillyrea angustifolia* are both excellent; the latter is the hardier of these two and succeeds well on cold, heavy land.

When a large hedge is required within the garden (except in very cold districts) some careful consideration might well be given to the claims of Laurustinus (*Viburnum Tinus*). It is a magnificent ever-green plant, beautiful in flower at any time during winter, the pink buds rivalling the white blooms. It should not be used where a trim hedge is required, since clipping robs it of its beauty, but if just kept in shape by being "knifed back" it presents a remarkably handsome and well-bred appearance, free from any suggestion of belonging to the "smart set." To avoid disappointing losses, Laurustinus should be planted in early autumn; when established, it grows quite fast enough.

A little observation will suggest a number of other plants that seem suitable for hedges, but only those which long experience has tested can be regarded as safe; guessing may easily result in bad language. Be careful to avoid plants that tend to grow loose, or, like the Penzance briars, are liable to get very foul and are also difficult to clean.

If, after wise reflection, it is decided to use a plant of which very rapid growth cannot be expected, consolation, if needed, may be derived from enjoyment of the luxury of feeling unselfish without any real loss of one scrap of personal pleasure ! Above all, remember that hedges should never be cramped for room nor treated as mere indications of a boundary, but regarded as objects of great beauty that are worthy of every attention. Gardeners, whom fate or temperament impels to become migrants, should make it a matter of virtuous pride to leave behind in each of their gardens some worthy mementoes of their transit ; a benefaction that is not costly and certain to be highly appreciated—two factors that are not common to all benefactions, whether public or private.

ORCHID CULTIVATION.

By Sir JEREMIAH COLMAN, Bt., M.A., J.P., D.L., V.M.H.,
Chairman R.H.S. Orchid Committee.

I MUST confess I found it difficult to suppress a smile when I received an invitation to communicate an article on Orchid-growing for so scientific a publication as the Royal Horticultural Society's JOURNAL. In a life overcrowded with varied and exacting activities, I have found it necessary and desirable to delegate responsibilities; thus the credit for growing my Orchids rests not with myself, but with those in whose capable charge my collection is placed.

I can make no claim to expert knowledge, and can merely boast of just that "little learning" which is said to be such a dangerous possession; but it matters little, as the expert will prefer his own methods, and it is the less experienced who may find something useful in the observations of an amateur. As a looker-on for upwards of thirty-five years, dating back to a time when my old friend Sir TREVOR LAWRENCE specialized in species and rare genera and when the late Baron SCHRÖDER, whose mantle is so nobly worn by the present Baron, acquired priceless gems of the Orchid world, I have perhaps some justification for expressing views in respect to the cultivation of Orchids. Many imported plants have been established in my collection, in days when plants were imported in larger quantities than at the present time; and I have been a more or less frequent importer of plants in small quantity, especially in directions where the trade finds it unremunerative. Moreover, there have been raised in my collection, from pollination of the flower to actual flowering, more than one thousand distinct crosses; and even with severe limitation of families, presuming an average of twenty or twenty-five to a family, this represents twenty or twenty-five thousand hybrids brought to maturity here, many of them very difficult subjects to deal with, as my crosses have been made with a view rather to distinct variation and for experiment than along easy lines. I have hybrids, one parent of which is accustomed to be wet and cool all the year round, while the other is a native of a hot and "dry" country, where its thirst is satisfied by an excessive bout of drinking for a few weeks in the year. I am not sure whether the offspring knows what its requirements may be; at any rate the grower has to do a good deal of experimenting before he finds out—if he ever does.

It has also been somewhat of a hobby with me to purchase plants of historic interest, as they have come into the sale-room, which appear to be at death's door; and thus my collection contains a larger quantity of "have beens" than is the case in most collections. Who else, for

instance, has a plant of *Cattleya Trianae* 'Mrs. Charles Dorman' ?—one of the most beautiful Trianaes ever seen, taking one back to the days of the Dorman Collection. The better-known *C. Trianae* 'Eboracensis,' and varieties of 'Crispum' of the old type, from the same collection, I still flower regularly. Historic plants, such as *Laelia Jongheana* (alba) *Ashworthiae*, *Cattleya Mendelii Bluntii* 'Mrs. E. Ashworth,' *C. Mendelii*, Quorndon House var. (illustrated in "Reichenbachia"), *Odontoglossum crispum* 'Franz Masereel,' *Masdevallia cucullata*, have all been "resurrected" and have required a good deal of nursing, but from the point of view of interest well repay the trouble.

My houses, too, are sometimes made a "Home for Incurables"; one little corner is a veritable "Inebriate Home," wherein are placed Orchids which have been submitted to the "drug habit," or may be "gassed" with ammonia, and which it is found take a very long period to cure of their trouble!

I have had, as a result of what is termed in polite language an idiosyncrasy, to submit to a certain amount of ridicule. For instance, having bought many years ago, on the dispersal of one of the most renowned collections, a reputed £300 *Odontoglossum* for a sovereign or so, and having asked my gardener whether he had seen the plant, he replied: "No, but a member of the trade who saw you buy it told me that if my head did not ache until I flowered the plant my governor had bought I should be a fortunate man!" Incidentally, the plant bore a fine spike within three years. Such resurrections serve a purpose, and are gratifying in the case of unique plants, but are better left to those who can give the most favoured conditions for a fresh start in life, and who are prepared to follow a "wait and see" policy.

Again, I suppose no collection has, when species and hybrids are taken together, greater variety than this. The public gardens probably have a larger number of species, but in those gardens hybrids are generally few; and it may be said, I think, of my collection, that we have all sorts and conditions to care for. So I hope on the whole I have established some right to accept the invitation extended to me. I shall assume, however, that it is not expected of me more than that I should generalize in hopes of giving some useful hints and encouragement to those who are already bitten, or are about to be bitten, by the fascinating and alluring hobby of forming an Orchid collection, if only of small proportions. This assumption appears to me probable, in that the Orchid grower—like the chef—through the facilities placed at his disposal by the gardening journals which weekly or monthly give sound and extensive advice, has ample opportunity of reference to methods of cultivation advised by the expert grower.

Like the chef who, after having followed a recipe, has only, say, to "allow to simmer till ready," so the gardener, having carried out the advice given, may fondly imagine that he need only wait to find his plants in robust health! But Orchid-growing is no exception to

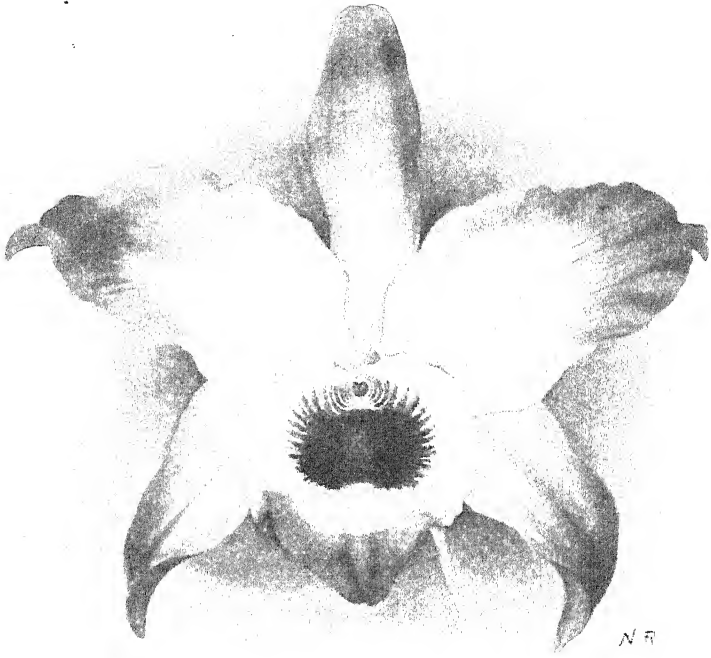


FIG. 50.—DENDROBIUM × 'LADY COLMAN' (D. ARTEMIS × D. FINDLEYANUM).

[To face p. 180.]

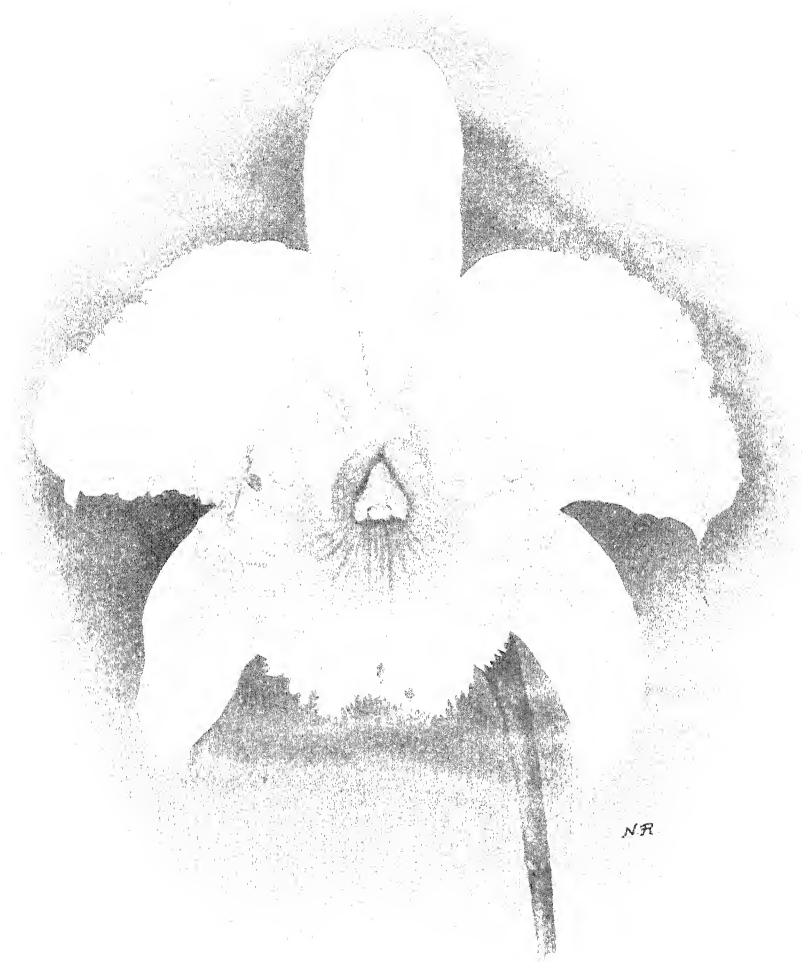


FIG. 51.—BRASSOCATTLEYA × 'LADY COLMAN'
($\frac{1}{2}$ size).

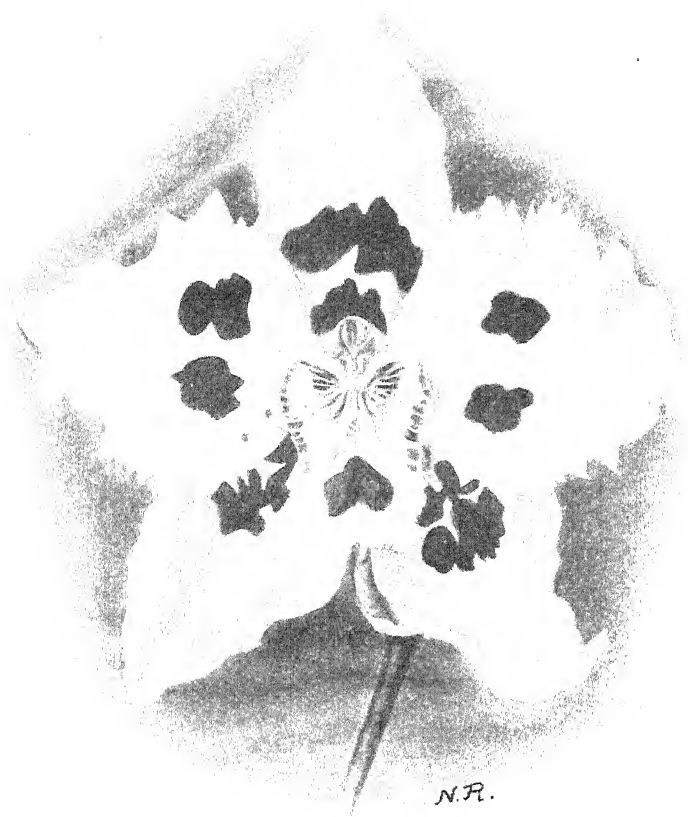


FIG. 52.—ODONTIODA x 'GATTON GLORY.'

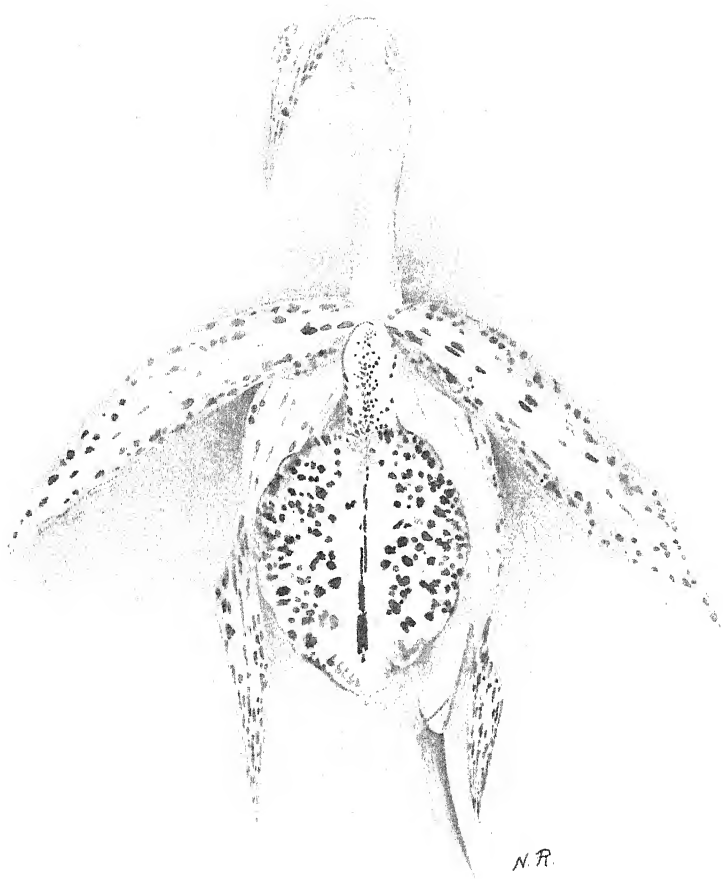


FIG. 53.—BRASSOCATTLEYA × 'MARY.'

[To face p. 181.]

the rule. There is a catch in it somewhere ; and, however carefully advice may be observed, success will not follow without the human touch, and the constant and intelligent observation which alone leads to success. The talented grower will require that wonderful and indescribable gift which we know as instinct. The owner of a collection, as well as the grower, should instinctively know on entering his houses whether temperatures are correct, and atmospheric conditions, particularly in respect to humidity and purity, are in a state suited to the needs of the plants ; and should know whether the plants are finding their surroundings congenial or the reverse. The qualifications required are not dissimilar from those of a nurse watching a patient : any change in the condition should be promptly noted and reported for special attention. No hard-and-fast lines can be laid down. The problem is a very difficult one, especially in the case of the many Orchids which require resting periods, since in their case it is natural for them to appear " off colour " during such periods, and it would be fatal to mistake this normal condition for ill-health. The indications may be a drooping or discoloration of the leaves, or a shrivelling of the bulbs, or a stunted growth, etc. But when the observer has made up his mind that the plant is not happy, it should be differently treated, or removed to new quarters and given a chance there. To quote a case in point—I had a plant of the beautiful *Zygopetalum rostratum*. Theoretically, and following the orthodox methods of treatment, it should be grown more or less cool. After trying it in many positions, with no satisfactory results, it was transferred to my propagating, or hottest, greenhouse ; it immediately picked up, and has been " happy ever after." Whilst showing the late Mr. F. SANDER through my houses, I noticed that his observant eye caught sight of the plant, and I thought that some excuse should be offered to avoid his thinking that we were ignorant of recognized methods. He replied to my explanation : " That is very interesting ; I think I can account for it : it grows in a very sheltered spot, and no doubt the temperature of its native habitat is higher than one might anticipate from the altitude and surroundings in which it grows." I give this illustration to demonstrate that one cannot always depend upon locality ; and the example given indicates the care and watchfulness necessary in order to grow one's plants to perfection.

It must also be remembered that the health and growth of plants depend not only upon suitable surroundings, but upon their constitution and antecedents. I have been much surprised by the many cases which I have experienced of plants acquired from renowned collections proving to be lamentably defective in root growth. The vitality of many genera is amazing : plants will go on year after year producing bulbs and flower spikes in spite of defective root growth, and so their failure to make healthy root growth remains unobserved. Of course, they cannot under such conditions show their true character. Some of the sources of supply have acquired—I think with some justification—a very bad reputation. Plants acquired from such

sources have been found difficult subjects to keep in health. Possibly owing to climatic conditions they have been grown too quickly and become soft; or some "food" may have been introduced, owing to contaminated water or less accidental circumstances, which whilst causing rapid growth proves injurious to the ultimate health of the plants. Human beings have been known to exist in apparent health in ill surroundings which would prove fatal to a new-comer; so perhaps with plants it is conceivable that when removed from these conditions the plant will no longer thrive without the stimulant to which it has grown accustomed. Inexperienced collectors would be wise to confine their purchases to the recognized trade houses, which can be relied upon to supply them with plants in health that will not require nursing or special treatment.

I here introduce a few sentences on the vexed question of what is termed "feeding"; and what I have to say thereon will be regarded as heterodox by the majority of growers. There is a general belief that "food" must have disadvantageous if not fatal results, except in a few special cases where it is recognized as beneficial by some growers. Amongst such exceptions may be numbered *Cymbidiums*, *Cypripediums*, and *Calanthes*. It is very evident—unless some particular grower has the secret—that no "food" has yet been discovered which can be used in growing a general collection of Orchids without serious prejudice to the plants. Experiments have been made by scientists—as, for instance, my friend the late Dr. SMEE—but the results were disastrous; and therefore "feeding" is not to be recommended, except for the purposes of experiment. But I have a conviction that some "food" should be found which will prove advantageous, and that the day will come when chemists will supply us with a non-injurious prescription. It appears to me that the logic of the situation clearly points to this. Orchids, just as is the case with other plants, deprive the compost in which they are growing of certain constituents which are essential to their well-being. In the case of other plants these can be restored by suitable fertilizers. It is recognized that Orchids have similar requirements, but the only acknowledged way of meeting these requirements is to give them fresh compost, either by a top dressing or repotting, a process often disturbing to the seedling or plant. Hence I am sanguine enough to believe that a day will come when an appropriate "food" will be found which can be given to Orchids in a way similar to that in which other plants receive stimulants.

I expect I shall lay myself open to challenge and reproach when I suggest we have something to learn in respect to the standard of good health which we have set up. The members of the Orchid Committee of the Royal Horticultural Society, over which I have for some years past had the honour of presiding, and which is representative of the brains and experience of the Orchid world, rarely give a Cultural Commendation except where the plant is in apparently super-robust health: making vigorous, possibly forced rank growth, and probably bearing a large number of flowers. In my experience it does not follow

that such a condition indicates health, and I feel that the coveted Cultural Commendation would often be better bestowed upon growers of plants of less vigorous constitution. In my early days of Orchid-growing it used to be a common saying in my garden that whenever we received a Cultural Commendation for a plant it was doomed to die within twelve months!—the fact being doubtless that it was too freely grown.

One thing is certain, plants must have no "coddling." It is, I think, recognized that a plant can be killed with kindness and attention, and that it may be for its good to be forgotten altogether for a period. In my greenhouses, as a last resort in the case of *Odontoglossums*, the bulbs are taken away from the pot and suspended with bass to the rafters in the potting shed and there left to work out their own salvation. A considerable proportion of such plants ultimately make a growth and are re-established.

When a Socialist or Communist Government has nationalized our mines, our railways, and so on, it will perhaps turn its attention to Orchid growers, and we may then have a National Orchid Society acting up to an adopted motto of "None for himself, all for the State"; but until we reach this millennium, exchange of knowledge will continue to be restricted. It would be unreasonable to expect it otherwise. Orchid growers are to-day a happy family, but the great trade houses compete and vie with each other in an endeavour to excel. The natural aim and instinct of each is to see to it that his own collection is well cultivated rather than to teach competitors the road to success. So also with amateur growers: rivalries exist which are highly commendable, but which inevitably tend to gardeners not desiring to communicate to others to the full "their secret of success." On the other side of the question, however, I remember, on the occasion of the visit of a well-known orchidist who had obviously come to Gatton to pick our brains, my gardener being so confiding that I remarked to him afterwards that I thought he had shown a very generous disposition, having regard to the obvious intentions of our visitor. He made the reply—which growers would do well to note—that he did not think it was of the least consequence, because he felt sure that if our visitor followed to the letter our methods, owing to different construction of his houses, or the different temperature, or different watering, etc., etc., he would meet with failure. The moral to digest is that methods must be adapted to surroundings before success can be expected.

When one sees the magnificent exhibits which are staged by trade and amateur alike, and notes the splendid health of some of the plants, one wonders whether there is a secret—whether the grower has discovered a fertilizer the use of which accounts for the robust condition of his plants. It may or may not be so; we can only surmise the truth. But be it noted that these very robust plants in any particular group are generally the exceptions and are not infrequently derived from one parentage, and stand out in striking contrast with

other plants exhibited or kept at home in the houses of the same grower ; and so the inference is that it is more probably due to the constitution of the particular plants, grown, of course, under the most favoured conditions, rather than to any secret fertilizer.

Those who are forming a collection, or thinking of growing a few plants only, would be well advised to consider carefully the facilities which they may have for growing Orchids, and the special abilities of their gardener, so as to make a selection likely to grow under prevailing surroundings, as it is inviting disappointment, and is not fair to a gardener, to attempt the impossible. Gardeners are human and Orchids are capricious ; and a gardener, even an expert grower, may succeed well with one family and fail altogether with another ; selection should therefore be made with due regard to his powers. Few realize when inspecting an important group of Orchids how many families are represented, each requiring widely different treatment and conditions of culture. In fact, at our great shows, a group of Orchids may represent a diversity of requirements approaching those necessary for the production of the rest of the plants in the show. Many lovers of horticulture attend these shows and make a selection from the various groups. In making a selection of, say, begonias or sweet peas, the question of culture need not be considered, because each will flourish under treatment required for the class. Not so when one comes to the selection from an Orchid group. I have heard of purchasers selecting half a dozen from a group, each one of which required placing in a different house—with perhaps two greenhouses at the most for their unfortunate gardener to attempt to grow them in ; nothing but disaster and disappointment can follow. Whereas, if they start by satisfying themselves as to what conditions prevail in their greenhouses, the attendant in charge of the group could at once tell them what they might reasonably attempt to grow. There is not the least difficulty in making a selection from some of the most beautiful Orchids in cultivation of plants which can be quite easily grown, and which are quite reasonable in price.

Another point worth bearing in mind is that if a specimen plant is purchased in perfect health no improvement can be looked for. It is almost inevitable that it will go back rather than forward. Beginners should on no account purchase plants out of health. But, on the other hand, if the plant is in a condition which gives room for improvement, the owner is much more likely to find satisfaction in the results than if he buys a plant in perfect health, heavily flowered, which in all probability, even if it remained in its old surroundings, would in twelve months' time have deteriorated.

The attempt to grow the difficult subjects is much better left to a later stage when experience has been gained ; but beginners may satisfy their consciences with the thought that they will be in good company, for even great gardeners are not above avoiding the introduction into their collections of families of Orchids which they fail to grow as successfully as others do. A glance at renowned Orchid

groups will show how much gardeners specialize in a few families, and how rarely one finds numerous families all of which are well or even satisfactorily grown. Of easy plants to grow, on which a start might be made, are *Cymbidiums*, amongst the most beautiful of Orchids, with graceful sprays of flowers lasting in perfection for many weeks, and which may even be grown in a house with a northern aspect; *Cypripediums*, which have the gift of withstanding fog and smoke, and the flower of which is also long lasting in perfection; and the beautiful and cool-growing *Odontoglossums*.

Art collectors would have the world believe that in making their collections they are influenced solely by refining and elevating tastes. How comes it then that the most treasured possession is almost invariably, regardless of beauty, the one which happens, through rarity or price, to be out of the reach of rival collectors? A base instinct would seem to hold them spell-bound. Leaders of society and fashion adorn themselves in "creations" which are more startling than becoming, and more costly than beautiful; and if the model from which their gown is designed comes within the reach of a lower caste it is promptly discarded. Orchid collectors cannot claim exemption. Many of the most beautiful genera are conspicuous by their absence, for no apparent reason except that they have become common. What Orchid, for instance, however costly, can surpass in beauty a well-grown pan of *Coelogyne cristata*?—and the novice left to feed on the crumbs which fall from the rich man's table has the good fortune thereby to be able to start a collection of distinctly beautiful and refined Orchids at an almost nominal cost, or even receive them as a gift. The standard is an arbitrary one where rarity counts more than elegance, and value than beauty. Thus those contemplating growing Orchids should not be put off by the common fallacy that they are difficult to grow and expensive to acquire. If suitable choice is made, they can be purchased so cheaply that the cost is not worth consideration, and many of the most beautiful are as easily grown as any greenhouse plant.

Thus far my contribution has been limited to Orchid-growing as usually comprehended, and, as foreshadowed, I have avoided, except superficially, entering into methods of cultivation, practical or technical. Now that I turn to the advanced, or scientific, side of Orchid culture, no such restriction is called for, growers having had but limited opportunity for initiation into its intricacies, or of realizing how intensely fascinating it may become, and how vast are the possibilities open for future research and experiment. There may be included in scientific methods of Orchid culture, hybridization, pure culture, artificial and experimental lighting, electric stimulation, and—may I add?—feeding.

On what slender threads hang our interests in life! When it occurred to a genius to make the rather obvious experiment of transferring the tiny pollen mass from one flower and placing it on the stigma of another, who anticipated that it would lead to results destined to revolutionize orchidology?—that it sounded the death-knell of the

travelling collector: that Orchid-collecting, as known in the past, would cease to be a profitable proposition, and that importing houses would as a consequence be compelled to discontinue their enterprise in this direction: that natural hybrids which were changing hands at fabulous prices would be surpassed by home-produced ones manufactured in their thousands by the instrumentality of mere man, and be offered at prices within the reach of every grower: that the fine and once treasured species which adorned our houses were doomed gradually to disappear therefrom: that groups would be set up containing no single specimen of a pure species, and that the colour of one and shape and substance of another would be so combined as to produce a result beyond imagination: that learned men would spend their time in examining and discussing the functions of the fungi essential to the completion of the germination of Orchid seeds: and that in place of pots would appear, in some greenhouses, glass tubes and flasks charged with mysterious solutions, on which myriads of Orchid seedlings would be seen growing. All this has been accomplished within a comparatively short period. Whither may we not be led!

I would strongly advise anyone proposing to enter upon a hybridizing campaign very carefully to consider the possibilities open to him, and to pursue his experiments with some definite end in view. The professional grower, as a result of long experience, is highly skilled, and moreover has many advantages and opportunities which do not come the way of the amateur, who before entering upon this interesting hobby should remember that he cannot expect definite results for a period of at least five years, and should consider how his raisings will compare with those of a generation ahead and not with those of to-day. There also enters into consideration the fact that hybridization is not confined to our country alone. Rapid strides are being made on the Continent, where climatic conditions are highly favourable. America is taking the subject up seriously, and in far-distant Japan attention is being given to it. In the latter country, Orchids are favoured subjects in the Imperial and other gardens; and when we find so enterprising a nobleman as Prince SHIMADZU evidencing a keen interest in this hobby, we may be well assured that, with the æsthetic taste and perseverance which prevail in everything which the Japanese take up, many notable successes will be achieved. Climatic conditions there are especially favourable to some genera, and they have already raised bi-generic and other hybrids which have proved difficult or impossible subjects here.

If the beginner follows stereotyped lines his hybrids are likely to get no further than what I think in racing phraseology is known as "also ran," which at best is a mortifying position. Some striking achievements can, however, be claimed by amateurs; as, for instance, the superb strain of *Cypripedium* hybrids which, after years of enterprising experiment, have been raised by Mr. G. F. MOORE of Chardwar. In the renowned Westonbirt Collection of Sir GEORGE HOLFORD, magnificent varieties of *Cattleyas*, *Laeliocattleyas* and *Cymbidiums* have

been raised. The Orchid family has been greatly enriched, and these wonderful hybrids rival the finest novelties raised by trade firms. I, too, can claim some success, particularly with *Dendrobiums*, culminating in the fine hybrid *Dendrobium* \times 'Lady Colman' (fig. 50), the much-admired golden-coloured *D.* \times 'Gatton Glory,' and the 1925 novelty *D.* \times 'Huia,' in which the beauties of *D. Reginae* are seen, as also some striking forms of *Brassocattleyas* (fig. 51), *Odontoglossums* and *Odontiodas* (fig. 52). But when a beginner realizes what has been accomplished, and remembers that democratic theories do not hold good in the case of Orchids, in the raising of which heredity counts for something and experience shows that you must have noble parents if you would raise noble offspring, he may well pause before following the already well-trodden routes.

There are, however, untrodden ways open to him which may bring fame. Should he possess a unique plant, he should on no account fail to make use of it for hybridizing purposes, and may have reasonable hopes of producing unique results.

The remarkable results arising from the use of *Miltonia vexillaria* \times 'Memoria G. D. Owen' as a parent is a case in point. When the stock of this plant realized well over four figures on the occasion of the dispersal of the late Sir FREDERICK WIGAN's fine collection, many thought that the purchasers were indulging in a wild speculation; but the results justified their expectation, and we have been given the beautiful new strain in which the claret-coloured butterfly mask is the feature. This genus has been further improved out of all knowledge by the introduction of varieties the sepals and petals of which are a rich and deep-coloured rose or claret. I expect that if we could trace the parentage back it would be found that all these high-coloured varieties are descended from an historic variety of *Roezlii*, described as of marvellous colouring, but long since dead; and if this surmise be justified it still further establishes the value of a unique plant for hybridizing purposes. *Brassocattleya* \times 'Mary' (*Brassavola nodosa grandiflora* \times *Cattleya Lawrenceana*) (fig. 53), with its grotesque form, is an example raised at Gatton of the result of an experiment on lines out of the ordinary. But success is by no means certain; for instance, all attempts to reproduce the striking characteristics of *Dendrobium nobile Cooksonii* and *D. Brymerianum* have failed.

Experiments can with advantage be attempted which, not being paying propositions, are not worth the consideration of the trade. For instance, I have at Gatton raised a strain of *Cattleyas* and *Laeliocattleyas* which have acquired a reputation and have become familiarly known as 'Gatton Blues.' Neither in size, nor in substance, nor in colour will the expert view them with favour: they fail to meet the arbitrary standard which the orchidist has set up; but when they are in bloom visitors to my houses are lost in admiration, and if expert Orchid fanciers look upon them with contempt, I console myself with the feeling that they are at least things of beauty and my

very own ! I am hoping against hope that some day I may produce a large-flowered *Brassocattleya* of 'Gatton Blue,' and then there will be a very different tale to tell ! Similar results can be obtained by others with advantage to horticulture, even if not favoured by the Orchid world.

Many growers find hybrids difficult subjects to raise. The absence of the essential fungi may prove fatal in the initial stage, otherwise no real difficulty presents itself. All young lives require more constant and watchful care than older ones, but, given attention, they will grow as freely or more freely than an older generation.

There are many enemies—creeping, flying, and floating—from which they must be protected, and one of these may devour at a meal a whole pot of seedlings ; whereas if it visits an established plant its hunger would be satisfied by a portion of the flower or stalk, and the mischief to the seedlings is naturally proportionately greater than to the older plants.

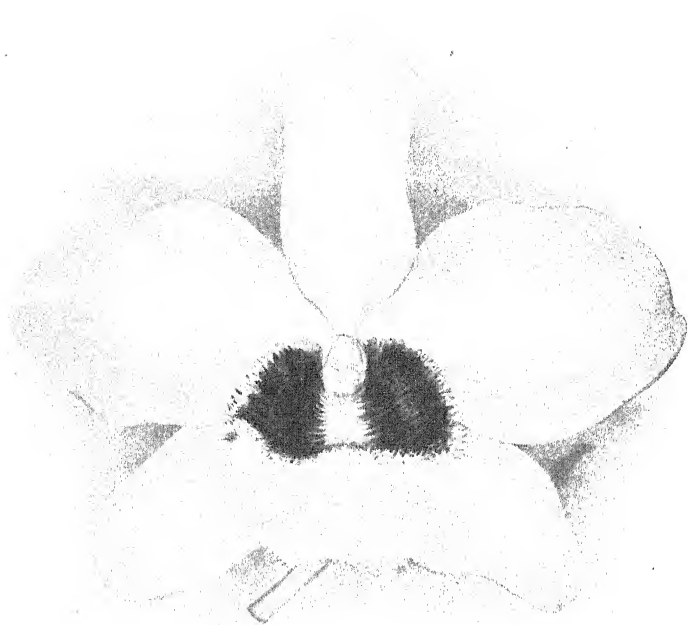
One of the most mischievous pests is a provoking, insignificant little insect, by name *Collembola*, or spring-tail, the larvæ of which hollow out the little green seed globules, leaving an empty shell. I have failed to discover any remedy for its depredations. Many injurious insects make themselves scarce for a time after fumigation, or can be kept under control by the simple method of sponging with a disinfectant ; whilst some are innocent enough to allow themselves to be trapped in a hollowed-out potato, or other deceptive retreat. Others are as cunning and illusive as a wild animal, and might tax the skill and patience of the big-game hunter to discover and track down. But, after all, we may console ourselves with the thought that a goodly number of seedlings survive—a larger family indeed than we can accommodate in our houses without overcrowding ; and the housing problem in the case of Orchids bids fair to rival the present acute difficulty in the case of labourers' cottages !

The mysteries of the essential fungus are important enough to have a paragraph to themselves. Scientists are not agreed as to the precise function which the fungus performs, or whether the fungus is in all cases actually necessary, or whether a substitute may not suffice. But it is generally recognized that the seeds of certain species, e.g. *Odontoglossums*, will not germinate without the aid of the fungus essential to the species or some substitute. Seeds of *Cattleyas*, etc., can be raised apart from the parent plant, apparently without fungus, although some think this not free from doubt. Some houses seem to be permeated with fungus spores, and wherever the seed is sown successful germination follows. In others the fungus would seem to be altogether absent. At Gatton, after years of sowing *Odontoglossum* seeds without result, I was on the point of giving up the attempt as hopeless, when young plants made their appearance, and ever since no difficulty has arisen—although an expert has blithely told me that some day I shall find the fungus will vanish just as mysteriously as it arrived ! The fungus may be found in the centre of



FIG. 54.—DENDROBIUM TAURINUM.

[To face p. 188.]



N.R

FIG. 53.—DENDROBIUM × 'GATTON SUNRAY.'

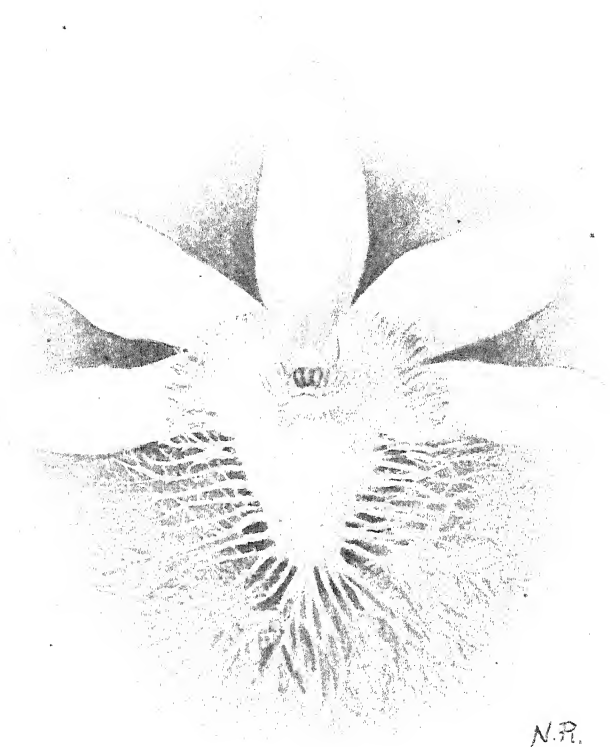


FIG. 56.—*DENDROBIUM BRYMERIANUM*, VAR. 'GATTON PARK.'

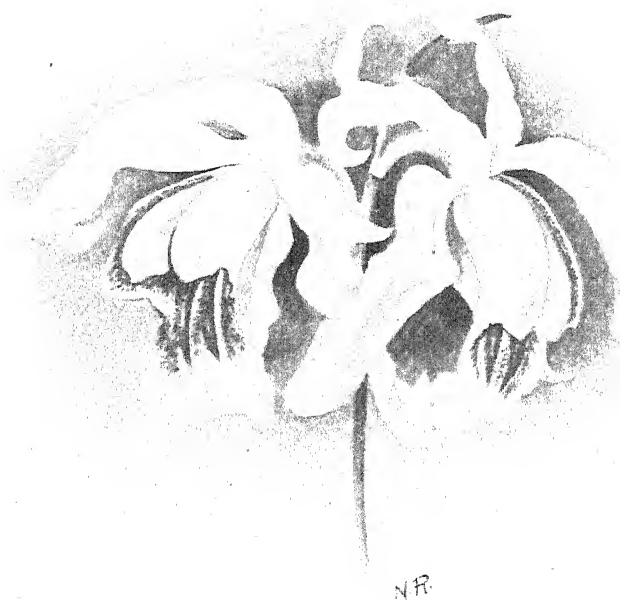


FIG. 57.—COELOGYNE x COLMANII.

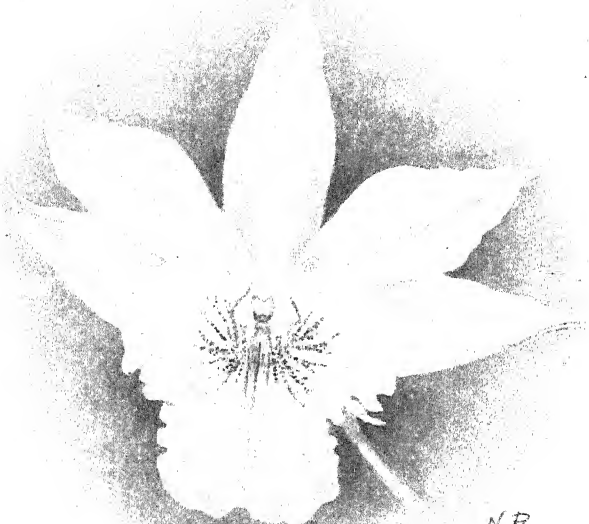


FIG. 58.—*Phaios-Calanthe* × *Colmanii*.

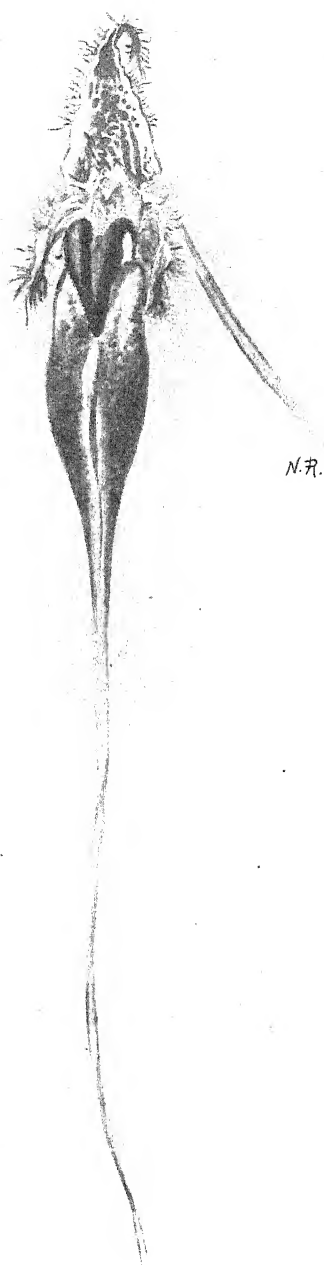


FIG. 59.—BULBOPHYLLUM FASCINATOR.

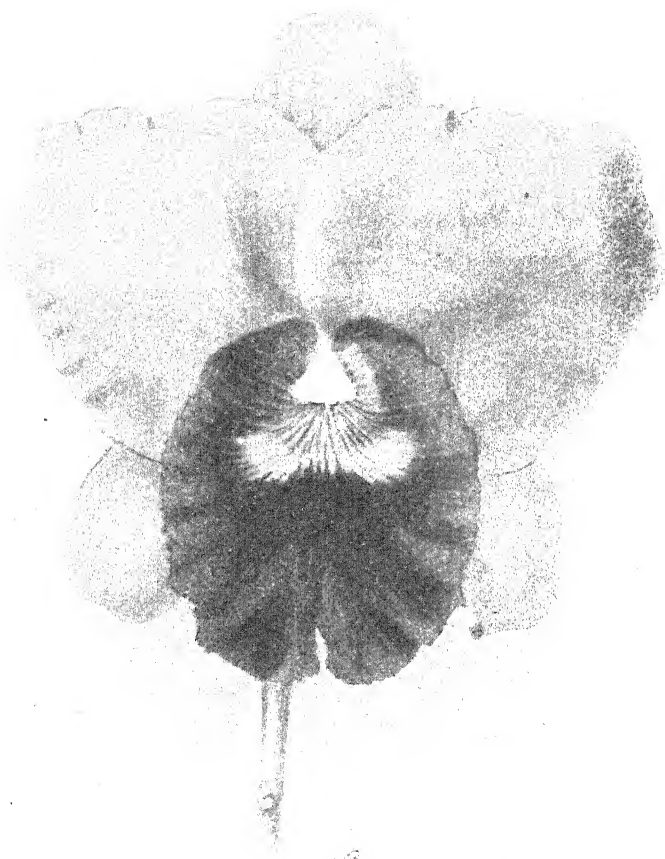


FIG. 60.—BRASSOLAELOCATTLEYA × 'ANTOINETTE' VAR. 'GATTON PARK.

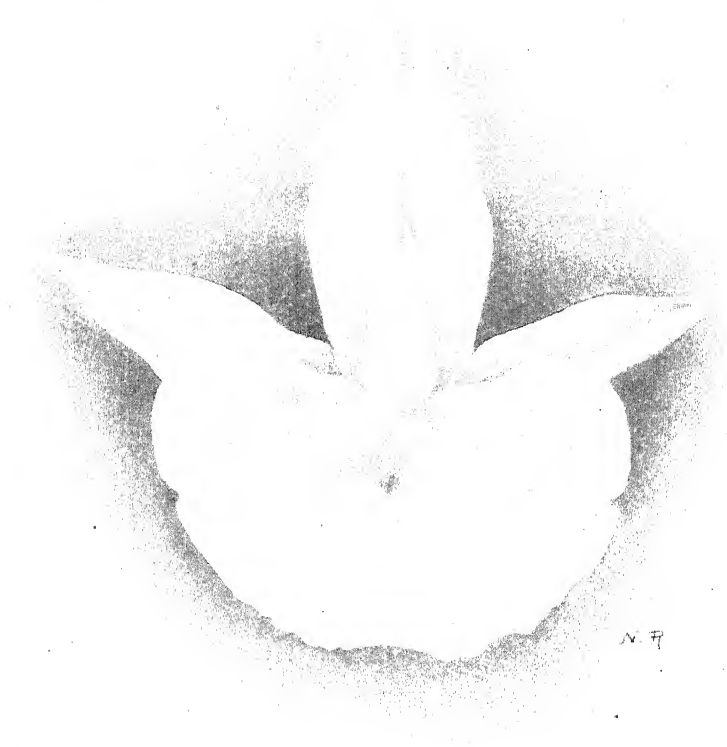


FIG. 61.—CATASETUM BUNGEROTHII VAR. 'MRS. TOM FIELDEN.'

[To face p. 189.]

the young roots which have entered the compost, rarely, if ever, in the aerial roots. A small section of root should be taken an inch or so from the point and peeled of its outer skin. The fungus will not be visible to the naked eye, but can readily be cultivated in tubes, given a suitable medium, and can upon cultivation be seen spreading over the surface of the medium, and frequently over the sides of the tube. It is web-like in construction. As far as I know there has been no success in transferring the fungus so cultivated for the service of seed exposed to the air, although I have heard indefinite suggestions to the contrary. Hybridists will discover upon sowing the seeds whether the fungus is present or not, provided the seed is fertile; but many genera, as, for instance, *Cattleya*, *Dendrobium*, etc., can be raised without giving any thought to the fungus, by sowing on canvas stretched over pots containing crocks and surfaced with appropriate compost.

When we turn from hybridization as commonly attempted to the much more scientific and involved methods known under the designation of "pure culture," we find growers are not in agreement as to the measure of its advantages; some, whilst acknowledging that plants make more rapid progress in the early stages, think that those grown under normal methods catch them up in the long run, and are in more robust health. They would have us believe that the old adage, "More haste, less speed," applies. But in Orchid-raising a speedy and a certain start is half the battle, to which has to be added the very distinct advantage, especially in the case of pods containing only a few fertile seeds, that such good seeds as there are will be given the maximum chance of germination. The mortality under ordinary methods is large, from various causes, including insect pests; and if a few seeds only germinate, they will, when making their start under ordinary methods, be at the mercy of any such enemy with an insatiable appetite. It is a well-recognized law of Nature that the most complicated crosses and those between the most refined parents produce the minimum of fertile seeds. Cases have come under my observation where a pod has apparently contained less than half a score of fertile seeds, although it has been estimated that the contents of a single pod may reach half a million seeds. It cannot, I think, be open to question that, in the case quoted, seeds have a better chance under pure culture methods than under ordinary methods. The result of another experiment in my houses was interesting and instructive, and shows that uncertainties exist under pure culture also. A sowing was made in a tube in which fungus had been cultivated on medium. A portion of the seed fell on the glass above the medium and remained dormant; a second portion fell on the edge of the medium: germination apparently started, but the seed died, presumably as a consequence of receiving insufficient food. Yet a third fell in the centre and produced a green mass, presumably gorged to excess; whilst a fourth fell still lower, where the fungus growth appeared less strong, and this brought forth fine young plants. The result will suggest the Parable

of the Sower. No doubt, with greater experience, more even results should be assured; and one can but expect to find it necessary to feel one's way at the outset at every turn. As pure culture methods become public property and are better understood they will doubtless be much more largely adopted. In practice they are at present beset with difficulties; they require the unusual combination of laboratory and garden methods to secure success. Strictly aseptic conditions must prevail. The removal of a stopper from a container, if only for a few seconds, will likely enough result in the introduction of mould spores. The mould will rapidly cultivate, and inevitably choke the fungus and prove fatal.

For the highly interesting experiments which have led up to pure culture methods we owe much to the patient research of the late Mr. JOSEPH CHARLESWORTH, to whom the Orchid world is greatly indebted. He, with expert help and advice from Mr. J. RAMSBOTTOM, an authority upon fungi generally, made Orchid-growing under pure culture methods a practical problem. It is the hybridist's misfortune, and not Mr. CHARLESWORTH'S fault, that the latter was head of a house growing Orchids for profit and not merely for pleasure, and consequently, open-hearted and kindly disposed to brother Orchid growers as he invariably was, the fruits of his experiments have been divulged to a limited extent only to the world at large. What has been accomplished in his establishment cannot be beyond the powers of others to work out for themselves; but it must involve delay and many disappointments, and require very great patience, although it is probable that success is due rather to careful manipulation and actual experience than to any close secret. As in the case of all discoveries, long research and experience will be necessary before our information is sufficiently complete for us to be able to judge in what way and to what extent the discovery can be used with advantage. But growers of Orchids with a scientific bent will be able to experiment in their houses with advantage and prospects not possessed by the ordinary grower.

In respect to the effect of artificial light, the use of sunlight by refraction and electric treatment, few experiments have as yet been made upon Orchids, and to a limited extent only upon plants generally. This leaves a wide and virgin field open, which might be very profitably explored by anyone with a knowledge of electricity and optics. Experiments in the nature of the application of artificial light go to suggest that in some cases the flowering period is advanced and in others retarded—more frequently the latter. No doubt results depend largely upon whether the sunlight which the plants are receiving is greater or less than they have been accustomed to in their native country or which they may require; but as artificial light has an effect not injurious, in some cases at least, upon plant life, one would be sanguine that advantageous results may follow experiments which might be extended to refracted light from the sun's rays. There has been a suggestion that rays from the moon have a special influence,

and that in certain phases thereof plants make more rapid growth. This may sound fantastic, but is based on observation: and why should it be more so in the case of plant life than in the case of lunacy and the tides? Anyone who has the scientific knowledge and opportunity of examining the subject experimentally may hope to become a national benefactor. The value of the ultra-violet rays in relation to the health of humanity is now recognized; and if data can be found in respect to the results of using artificial light and radiation upon Orchids, inferences may be drawn with far-reaching effects. Orchids suggest themselves as very ready subjects on which to experiment, as in their early stages, at any rate, they require so little space, and will so speedily respond and show the results of treatment.

Skilful and scientific methods have accomplished much. The position occupied by the aristocrat of floriculture is supreme and unapproachable. At the great Chelsea Show of the R.H.S. in 1924, a trade Orchid group won the Challenge Cup for the most meritorious display against all exhibits, whilst a group set up by an amateur won the Cup for the most meritorious amateur exhibit in the show—a significant and convincing triumph. No flower approaches an Orchid for lasting qualities. In 1923 I dispatched plants in flower from my gardens at Gatton: they crossed the Atlantic, and arrived fresh enough to be set up in a group at the American International Show held at Boston, U.S.A. But, however much has been accomplished, the possibilities of the future are great and inviting. They await the interest and attention of those capable of undertaking and following up scientific experiments, which cannot fail to be of value remote from the Orchid world. Who, I wonder, is destined to make history and win fame?

RHODODENDRONS FOR THE ROCK GARDEN.

By E. J. P. MAGOR, F.R.H.S.

WHEN it was suggested to me that an article on the smaller species of Rhododendrons would be of interest to the readers of the R.H.S. JOURNAL, I asked counsel of a friend who is a great gardener and has also the pen of a ready writer. He acquiesced in the suggestion, and added that I must not make the article too scientific. Though far from his intention, this might have savoured of mockery when addressed to one who has had no scientific training and has picked up such small knowledge of plants as he possesses from friends and from books. But when one comes to close quarters with the subject one finds that it is not easy to differentiate between the various species without the use of scientific terms, unless one has the seeing eye and the gift of language wherewith to picture each plant so that the reader may see it for himself. And this, I fear, is very far beyond me. So I must ask my readers to bear patiently with my deficiencies and keep in mind the difficulties of the task.

I repaired to Mr. E. H. WILDING's invaluable book, "Rhododendrons: their Names and Addresses," and going through it discovered that there were some 125 species which answered to the required description. Of these it appeared that only thirty-seven were represented in my garden, whilst at the same time want of leisure and lack of means have prevented me from seeing other gardens, chief among them, perhaps, the Royal Botanic Garden at Edinburgh. So it seems that this must be but a very partial and lame exposition. Yet it may serve to bring to the notice of a wider public the great variety comprised in the genus, and the use which might be made of it in small gardens generally, and especially in the rock garden.

There are of course the regular alpine Rhododendrons which, in the Chinese mountains, take the place of heather; and besides these there are various other species, coming from different groups, which occupy but little room and are beautiful both in leaf and flower.

Already there is a considerable quantity of these plants in cultivation, and they are admirably adapted to the rock garden, in that they form compact little bushes and their roots do not spread to the injury of their neighbours; also, coming in most cases from a very high altitude, they are absolutely hardy. But all gardeners are aware that they dislike lime, as do all Ericaceous plants.

As is now fairly well known, the late Sir ISAAC BAYLEY BALFOUR, to whom lovers of Rhododendrons owe more than to any other man, divided the genus into series, indicating the salient points of each group. These I propose to take *seriatim* and mention some of the plants in each.



FIG. 62.—RHODODENDRON PARVIFOLIUM.

[To face p. 192.]

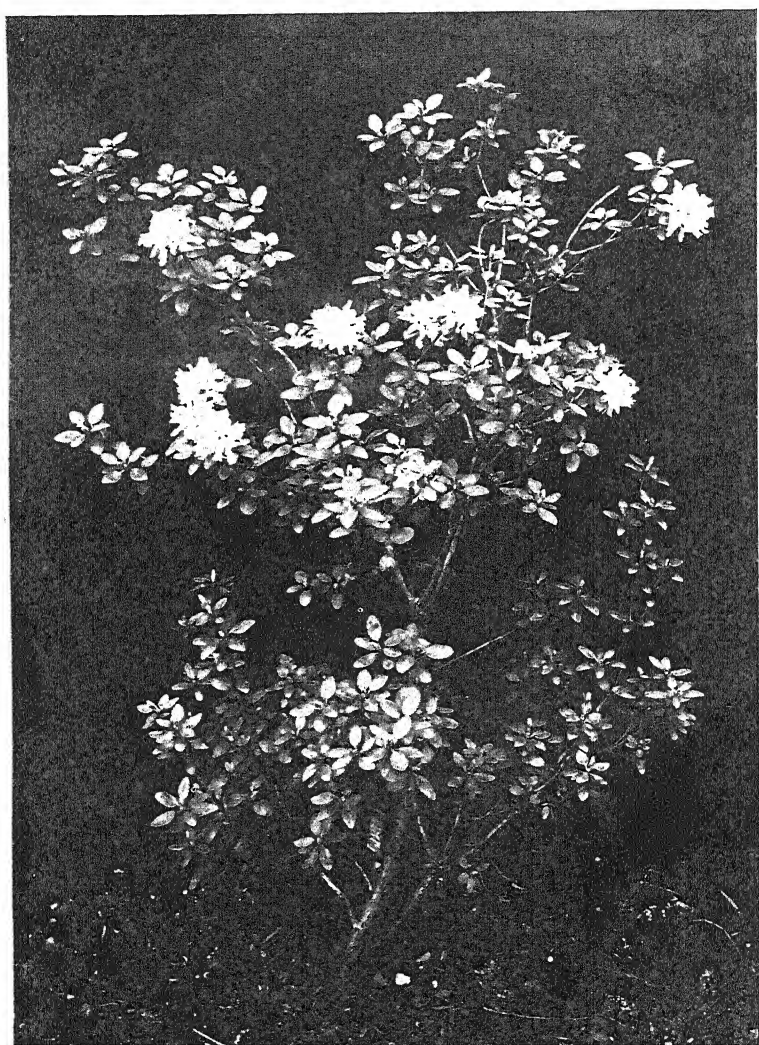


FIG. 63.—RHODODENDRON INTRICATUM.

The Lapponicum series is perhaps the most numerous, and is comprised of dwarf shrubs usually erect, evergreen, and small leaved. Their flowers are small, one to twelve in a terminal umbel, and range in colour from rose-violet through purple and lavender-blue to yellow.

And, by the way, Sir ISAAC wrote me some years ago that *Rhododendron lapponicum*, on which the series is founded, was not in cultivation so far as he knew, the plant which is generally grown under that name being *R. parvifolium* (fig. 62). *R. intricatum* (fig. 63) has been with us longer than most of this series. It was introduced by E. H. WILSON in 1904 from Western Szechuan in China, and made a considerable sensation when first exhibited, as its lavender-blue flowers provided a colour not before seen. It is a small-growing shrub with stiff little branches, tiny dark green leaves, and flowers in twos and threes at the end of the shoots. The corolla tube is long in comparison with the spread of the limb, and the style and stamens inconspicuous.

Like its allies, it is easily increased from cuttings inserted under a bell-glass beneath the shelter of a north wall in July or August, and from seed when it is produced. More attractive than this, however, is *R. fastigiatum*. It is more spreading in growth and its flowers are larger, with a shorter tube and more conspicuous style and stamens. Plants differ somewhat in shade of the flowers from deep lavender-blue to purplish-blue and bluish-pink. The leaves have a hoary appearance and this is the characteristic which chiefly distinguishes the species from *R. impeditum*, a close ally, the leaves of which are dark green.

The Abbé DELAVAY first discovered *R. fastigiatum* (fig. 64) in 1885, and it seems to have been introduced by several collectors, whilst we owe *R. impeditum* (fig. 65) to G. FORREST, who sent its seed home in 1910. WILSON, again, provided us with *R. verruculosum*, a more upright shrub but small and slow growing, with rich purple flowers. Of a still darker purple is *R. rupicolum*, a plant of FORREST'S, the seed of which arrived in 1920. The leaves of this are dark green with brown scales beneath, with which the twigs are also coated, so that the whole plant conveys the impression of dark brown-green. FARRER'S 1047 is very closely akin to it, and I hear that Sir ISAAC gave it the provisional name of *R. propinquum*, but this has not yet been published.

Of *R. cantabile* I have seen but one fragment, and from this I should judge it to be a fine thing, for the leaves are rather large for the section and there are ten bells to the truss, deep lavender-blue with a white eye.

R. scintillans is a somewhat larger grower than the preceding; its branches are longer and very slender and its habit laxer. The flowers are pale purplish lavender-blue, and it is a pretty thing, though at times it looks rather washy.

One of the most ornamental of the group is *R. hippophaeoides* (fig. 66), upright in growth, and so far three to five feet high. The leaves are greyish-green and the flowers various shades of lavender-blue, wide open with rich brown stamens and gathered in a compact truss of

eight to ten bells. These, however, are rarely if ever all open at the same time, but as some of the first opened fade those below succeed them. This and *R. scintillans* are bog plants in China, but they do not seem to appreciate such treatment in this country and resent anything like stagnant moisture.

There are a good many other species in the series which to the ordinary gardener are much like the preceding; some of these are in cultivation and have already bloomed, whilst others are still in the seed pans.

R. cremnastes—FORREST and FARRER—is described as soft bright pink and *R. cheilanthis* as deep rose, which appear to be rather exceptional colours in the section; whilst *R. ravum*, though belonging to the series, is a much larger grower, reaching twelve feet in China. It is allied to *R. hippophaeoides*, but is bigger in all its parts and its flowers are violet-rose. It is not a very quick grower, and would do for the rock garden for a time, to be moved out when it had outgrown its place.

In addition to these there are several species with yellow flowers. Of these the best known is *R. primulinum* (fig. 67), or rather *flavidum* (fig. 68), an upright plant with clear pale yellow widely-opened flowers, the beauty of which is enhanced by bright brown stamens. This is a very lovely species, its one drawback being that it blooms early and is rather apt to be frosted. There is in my garden what is, I imagine, a natural hybrid from the above, of the same habit but with pure white flowers somewhat larger than those of the type, and a most attractive plant it is. KINGDON WARD'S *R. chryseum*, the Yunnan representative of this Szechuan plant, differs from it in having rather larger flowers and more of them to the individual truss, and here at any rate is a stouter and more compact grower. *R. muliense* is another of the same lot, the flower of which KINGDON WARD describes as cadmium-yellow, and this appears to have been discovered both by him and by FORREST.

R. saluenense gives its name to another series, the plants included in which are dwarf, sometimes prostrate, with stout branches and small ovate leaves usually fringed with hairs, light green above and paler beneath. The flowers are very large for the size of the plants, which are ornamental even when not in bloom. They are in twos and threes at the end of the shoots, purple or violet in colour, often with black spots on the upper lobes, very widely campanulate, almost salver-shaped. *R. prostratum*, which has been with us somewhat longer, is a smaller plant, with black-spotted rose-crimson flowers. It comes from a great altitude—15–16,000 feet—and so far as my experience goes is not so amenable to cultivation as the others; but given a well-drained situation in the rock garden, preferably facing north, there seems no reason why it should not be a success, particularly in the northern parts of the country. There is a hybrid between this species and *R. fastigiatum*, which has deep violet flowers and is admired by some; and another between *R. prostratum* and *R. saluenense*, which so far has had but one flower, darker than those of *R. saluenense* and unspotted.

R. amaurophyllum is another member of the series, one gathering of the seed of which is described in FORREST'S "Field Notes" as being from plants with blue flowers tinged purple. I have had no opportunity of seeing it, but it sounds most attractive.

R. charidoties is a find of FARRER'S, notable for its bristliness and its great crimson-magenta flowers; whilst *R. humicola*, an introduction of 1921, is pictured as possessing deep plum-coloured blooms.

R. calostrotum—FARRER and WARD—is possibly the best known of the section, and is a remarkably beautiful little shrub with greyish leaves and large purplish-crimson flowers in twos or threes at the end of the shoots. These hold themselves sideways to their pedicels and stand out well above the foliage. Among my plants of this species are three or four looking like natural hybrids with some form of *R. trichocladum*, but as yet they have had no flower. I should judge from its appearance that *R. Chamaecistus*, a native of the Tyrol and a very old plant in cultivation, might perhaps be one of this series, but my recollection of its flower, which I have not seen for some years, may be at fault, and in any case I have no authority to go on. It is a dainty little plant with three or four purple flowers at the end of the shoots, and small ovate ciliated leaves; but as a rule it does not seem easy to cultivate, especially in the South of England.

This series should be useful in the hands of the hybridist, and, mated with some of the other dwarf species, should increase the size of flower and produce some dark violet hues.

Another very distinct series is that based on *R. campylogynum*, a tiny shrublet with glossy green leaves and very dark purple flowers, tubular-campanulate in shape, with a bloom on them like that on a black plum, in pairs or threes on long erect pedicels and fleshy in substance. This species grows as an undershrub amid bamboos and small Rhododendrons, and, having a considerable range of altitude, is perfectly hardy. This is the only one of the series I have seen in flower.

Of the others, *R. charitopes* is described as having clear apple-blossom flowers, flushed more warmly in the upper lobes, spotted crimson and with a deep rose tube. This is a distinct break of colour and should be an acquisition.

KINGDON WARD'S *R. charitostreptum*, on the other hand, has unspotted yellow flowers, and its discoverer avers that it is one of the prettiest dwarf Rhododendrons.

The other most characteristic species are inclined to run to black plum colour, sometimes shaded with red or purple, but there is a distinct phylum included in the series, the type plant of which is the comparatively well known and tender *R. Boothii* from Bhotan. In this the flowers are mostly yellow, and although bell-shaped are not so long and narrow; also as a rule the plants grow larger. One of them, *R. aureum*, from FORREST'S description reaches six to ten feet, but as it blooms in quite a small state I have included it. It is an inhabitant of thickets at 11,000 feet, but in spite of this it does not seem absolutely

hardy. The leaves are long and narrow, light green above and glaucous beneath, and the flowers, three to five to the truss, are not large, but very yellow and brighter than those of *R. Boothii*. There is an interesting cross between the pale yellow Himalayan *R. triflorum* and this species which, however, has not yet reached flowering size.

R. brachyanthum and *R. hypolepidotum* are small-growing species, not so straggly as the above and a good deal hardier; the flowers of both are a rather paler yellow and are produced very freely. Both are worth growing, but *R. brachyanthum* has the prettiest foliage, the leaves being lanceolate, dark green above and glaucous on the lower surface, and so pungently aromatic as to have incurred opprobrious epithets in FORREST'S "Field Notes."

The most beautiful of the phylum which has bloomed in cultivation so far is *R. sulfureum*, described long ago by FRANCHET, which has clear butter-yellow flowers in fives, the exterior of which is adorned with conspicuous brown-red glands. It has oblong ovate glandular leaves about four inches long, more or less glaucous on the underside, and its habit is low and spreading but not very compact. *R. megeratum* vies with it, and Sir ISAAC BAYLEY BALFOUR judged it from the dried specimens as one of the most charming of the dwarf Rhododendrons which FORREST had collected, and his opinion is fully borne out by the behaviour of the plant in cultivation. He added that it should be an effective rock-garden plant.

It has a much closer habit than *R. sulfureum*, oval leaves produced in abundance clothing the stems very thickly, and large fleshy flowers of a pale citron-yellow solitary or in twos at the extremity of the shoots. It came here—a most welcome present—from the Edinburgh Botanic Garden as *R. Valentinianum*, but is distinct from that species, which belongs to quite another series and has been described as a "yellow ciliatum." Mr. FORREST was my fellow-visitor last year at the house of a friend, and was kind enough to point out to me the true *R. Valentinianum* which, though not in flower at the time, was obviously different, being a larger grower and less compact.

R. monanthum is another yellow-flowered species, allied to *R. sulfureum* and distinguished by its solitary flowers, which so far as I am aware have not yet been produced in this country.

Next there is the *Cephalanthum* series, a set of stiff little aromatic bushes, with small leathery leaves, dark green above and clad on the under surface with a spongy brown indumentum. The flowers are small, usually eight to ten in terminal trusses, and vary in colour from white to yellow and pale pink. *R. cephalanthum*, the type species, was discovered by DELAVAY and described by FRANCHET as long ago as 1885. It has pure white flowers, and *R. cephalanthoides* differs from it only in minute botanical details, including the slightly different shape of the flowers. *R. chamaetortum* is represented by Sir ISAAC as a delightful alpine shrub, and was discovered by KINGDON WARD at 15,000 feet, forming six-inch carpets bedecked with pink flowers, but I have not seen it and do not know if it is in cultivation.

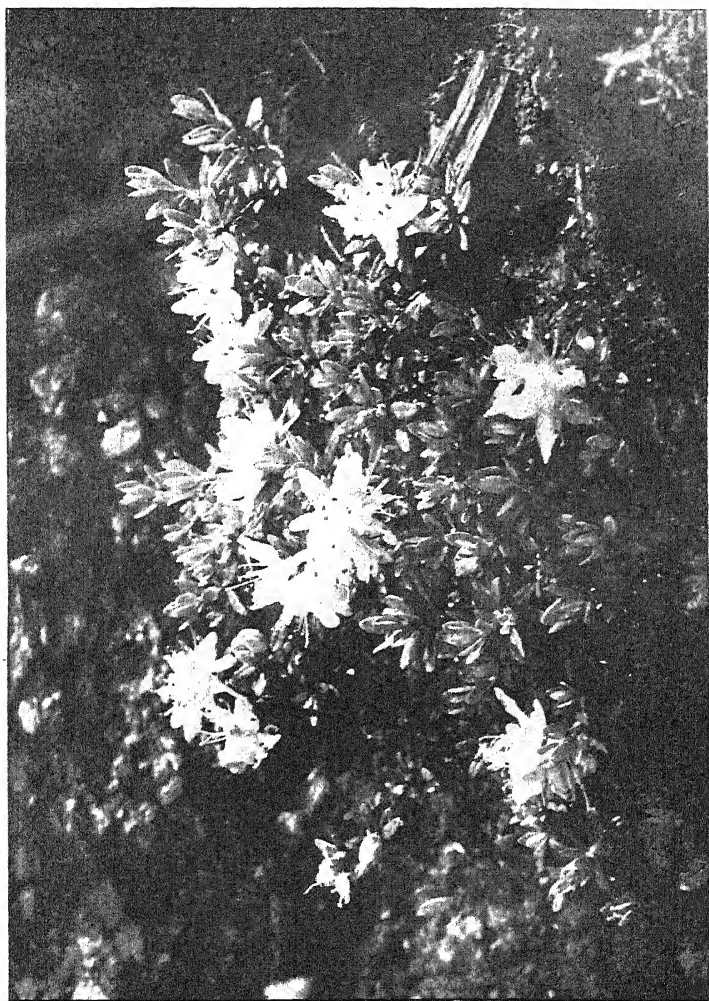


FIG. 64.—RHODODENDRON FASTIGIATUM.

To face p. 106.

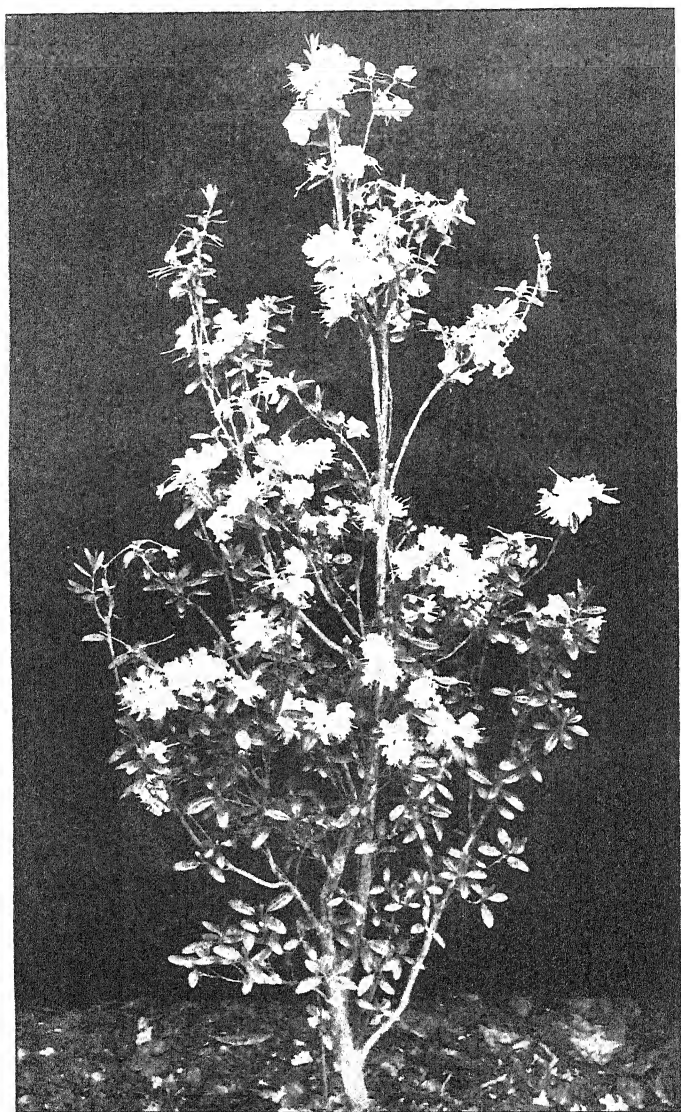


FIG. 67.—RHODODENDRON PRIMULINUM.

[To face p. 197.]

R. gymnomiscum, *R. nwaïense* and *R. praeclarum* have yellow flowers, and so has *R. Sargentianum*, a fascinating little bush with slender ground-hugging twigs and tiny leaves bright dark green above and with a marked network of veins. I have found it rather difficult to grow and prone to die off for no apparent reason—probably our heavy soil and superabundant rainfall were the cause.

R. sphaeranthum and *R. ledoides* are somewhat larger and more erect, with very narrow leaves and pink flowers, which put one in mind of those of a *Daphne*. They are particularly attractive, and are always noticed and usually asked for by visitors, but unfortunately home-saved seed has not germinated well here.

R. lepidotum, discovered in the Himalayas by WALLICH and Sir J. D. HOOKER, gives its name to another series, the plants included in which are twiggy aromatic little shrubs, lepidote all over and differing considerably in size. The type species has rose-purple flowers singly or in twos and threes at the end of the shoots, whilst *R. sinolepidotum* from China resembles it but is smaller in all its parts.

R. salignum and *R. elaeagnoides* are near *R. lepidotum* but have dull yellow flowers, and there is a beautiful form named *R. lepidotum* var. *chloranthum* figured in HOOKER's monograph with white flowers spotted green, but I do not know whether it is, or ever has been, in cultivation.

R. thyodocum, lately discovered by COOPER in Bhotan, has as many as eight purple flowers in an elongated truss, whilst *R. Baileyi*, a much larger and more erect grower than the preceding, has up to sixteen. Captain BAILEY was the finder of this in Southern Tibet in 1913, and it grows and flowers well in this country.

The anthopogon and fragrans series may be taken together. They are not, so far as I have seen, particularly attractive, have usually small pink or yellow flowers, and are very aromatic.

The series founded on *R. Forrestii* comprises plants which are a wide departure from the generally accepted view of Rhododendrons. For though its members have leaves fairly large when compared with those of the alpinas, they are quite prostrate, and in China climb over boulders, rooting at the joints like the common ivy.

I do not know that *R. Forrestii* itself has bloomed in cultivation, but its near ally, *R. repens*, has, and a wonderful thing it is, for its usually solitary flowers are tubular-campanulate, 3·8 cm. long, and scarlet-crimson in colour. Unluckily they are, as a rule, level with the ground and slugs are quick to browse on them. Several more of the series are known, but to the best of my knowledge have not yet flowered in cultivation.

Of these *R. serpens* has deep rose flowers and so has *R. porphyrophyllum*, whereas *R. Forrestii* itself is dark crimson and *R. erastum* clear rose. Nothing could be more beautiful than these as rock-garden plants, and it is to be hoped that ere long they and their congeners will become more easily obtainable than they are at present.

One word of warning: in my limited experience they seem to be

more than usually shallow-rooted and hence impatient of drought. I may be wrong in this, but in 1921 I lost a fine and well-established plant of *R. repens* which had been put on the north side of a gigantic stump of *Pinus insignis*, in the hope that it would some day climb over it. The aforesaid stump, however, was in a sunny place, and there were no stones there, so it may be that had it been planted in a properly made rock garden, wherein its roots could have hugged the cool sides of the stones, the tragedy would not have occurred.

R. Fittianum is a small upright plant of the dauricum section, with pale violet-rose flowers. It is interesting as being a "rogue" among seedlings of *R. radinum*, and appeared at Werrington Park when Mr. FRTT, after whom it is named, was in charge. These rogues occur now and again among imported seed, and are always worth looking after; for although they are often of some known species it happens occasionally that they are a complete novelty, either a species or perchance a natural hybrid. For instance, in this garden *R. peregrinum* and *R. xenosporum*, two very fine species, have already flowered, the first appearing among seedlings of *R. galactinum* and the second among those of *R. adenogynum*; whilst another seed-pan produced a batch of eight or nine plants which, I am firmly convinced, are natural hybrids between *R. haematodes* and *R. neriiflorum*. This year another Chinese rogue had flowers of a wonderful shade of orange-pink, and this looks as if it might be a natural hybrid between *R. neriiflorum* and *R. dichroanthum*.

Other rogues among the Rhododendrons have been *R. xanthinum*, *Clethra Delavayi*, *Saxifraga Delavayi*, a species of *Briggsia*, and several Primulas. So that it behoves the custodian of the seed boxes to keep a sharp eye on any strange-looking weed, for thus he may entertain an angel unawares.

R. hirsutum from the European Alps, and especially its white variety, are admirable rock plants, with the additional advantage of having a liking for, or at any rate no active objection to, lime.

R. Keiskei, a dwarf Japanese member of the triflorum series, is a peculiarly charming little plant, spreading and well clothed with light green ovate leaves often tinged red, and pale yellow flowers which in size and shape nearly resemble those of the much larger Himalayan *R. triflorum*. It seems to be hardy enough, but flowers so early that it is frequently frosted. Yet it is a treasure to such as are lucky enough to possess an alpine house, or it can easily be wintered in a cold frame and brought indoors to flower.

R. ciliatum and *R. glaucum*, despite the fact that they were introduced by Sir J. D. HOOKER in 1850, must not be omitted. The former with large pale pink flowers and the latter with rosy-purple are both worth a place anywhere, being semi-dwarf and very floriferous; they are usually ready to start their display when only six inches high. A further description of such old plants is hardly necessary, but a warning may be added that they flower early and may therefore get frosted, so that a situation shielded from the morning sun is advisable.

The comparatively old *R. racemosum* and its varieties are of course admirable rock plants, at any rate for a time. Although they eventually reach five to six feet, they flower when very small and present a wonderful spectacle of pink and white when in full bloom, for they flower all up the stem in the axils of the leaves. The variety *oleifolium*—not to be confused with *R. oleifolium* of FRANCHET, which is quite a different species and very near to *R. virgatum*—is certainly an improvement on the type. Moreover, FORREST has lately sent home seed under 19404F, which he describes as “a compact dwarf shrub six to fourteen inches high with deep cerise-pink flowers.”

R. proteoides, which gives its name to a phylum of the Roxieanum series, has not, I believe, yet flowered in Europe, but from FORREST’S description should be a most desirable species, for it is very dwarf and slow growing, well clad with smallish oblong lanceolate leaves, tomentum covered as to their lower surface; and it is some day to delight our eyes with trusses of eight canary-yellow flowers with crimson markings. May that day be in the near future! It is not supposed to be as easy to cultivate as some, and Sir ISAAC says that its thick coriaceous leaves with their dense coating of rufus indumentum tell of a dry environment. Be that as it may: for the present it is doing well with me in a rather damp bed facing north.

Then there is *R. Williamsianum*, and surely no lover of the genus ever had a more charming plant named after him! Though of the campylocarpum series, it forms a low-spreading bush—my old plant, for instance, is forty-two inches across and only fifteen inches high—with slender twigs and leathery egg-shaped leaves on rather long purple-tinted stalks, whilst at the end of the shoots are large pale-rose flowers openly campanulate and usually in pairs. It is an altogether delightful little species and should be in every garden, though from the dimensions cited above it should be clear to every potential owner that ample room for lateral expansion is necessary.

In conclusion, there are the haematodes sanguineum phyla of the neriiflorum series. To be quite candid, neither *R. Williamsianum* nor any of these are quite suited to the smaller rock garden, a work of art in miniature as it may be and doubtless very often is. But for the larger examples throughout the country—and there must be many such—the individuals in these sections should in years to come be priceless possessions, since they are thoroughly hardy, lowly in growth, ornamental in leaf; and what a marvellous range of colour is theirs! True it is that few of them have so far flowered in cultivation, but those few are quite sufficient to whet our appetites for more.

Whilst *R. dichroanthum* and *R. apodectum* are orange, and *R. haematodes* is deep ruby-red, there is an abundance of new material in the nursery beds and seed boxes, whereof the intrepid collectors give us some fascinating details. Thus there is *R. haemaleum*, described as black-crimson, almost black in bud, and *R. sanguineum*, which is crimson-scarlet. There is *R. leucopetalum*, which is pure white, and *R. citriniflorum* bright lemon-yellow; there are species yet unnamed with

yellowish-crimson and orange-crimson flowers, and so on and so on, until apart from blue almost every shade seems to be represented. Best of all, these species come from high altitudes and there should be no possible doubt as to their hardiness.

The question has been asked as to whether these plants as a whole will stand direct sunlight, and on this point I have consulted Prof. W. WRIGHT SMITH of the Edinburgh Botanic Garden, and a friend in Sussex as well, so as to get their experience in addition to my own. The general consensus of opinion is that they approve of it if the roots are protected and the rooting medium is fairly moist. The plants are inhabitants of a region where there is constant rain and mist, but the light during the clear intervals is intense and there is little doubt that they resent drip and overhead shading. Wherefore one is inclined to think that the conditions of a rock garden should be eminently suitable, more especially if a preference be given to a north aspect.

And thus must end this imperfect survey of the smaller *Rhododendrons*, of which but a tithe are mentioned, partly owing to lack of space and partly owing to ignorance. But enough has been said to show what may be done with this genus in the rock garden. It only remains for some fortunate individual, possessed of a mile-long cliff facing north, fronted by a decent boulder-strewn soil, and a sufficiency of labour, to put precept into practice. May some of us live to see the success of his efforts!

To the Regius Keeper of the Royal Botanic Garden at Edinburgh I am indebted for the photographs which lighten the monotony of the letterpress. They were taken by Mr. R. M. ADAM in that garden, and are excellent representations of some of the *Lapponicum* series. To him and to Prof. WRIGHT SMITH therefore I tender my most grateful thanks.

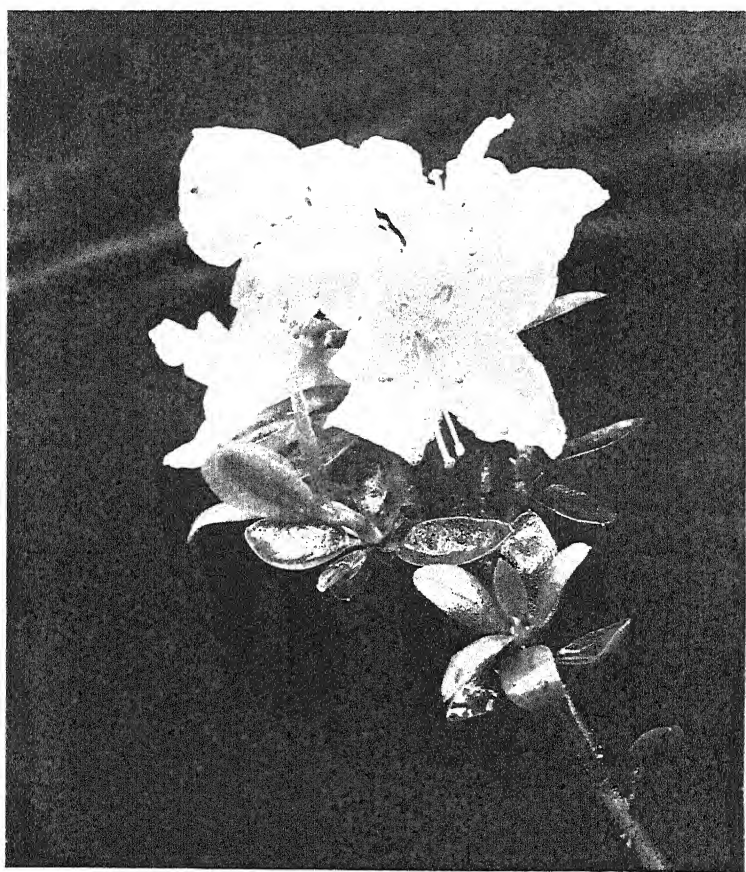


FIG. 68.—RHODODENDRON FLAVIDUM.

[To face p. 200.]

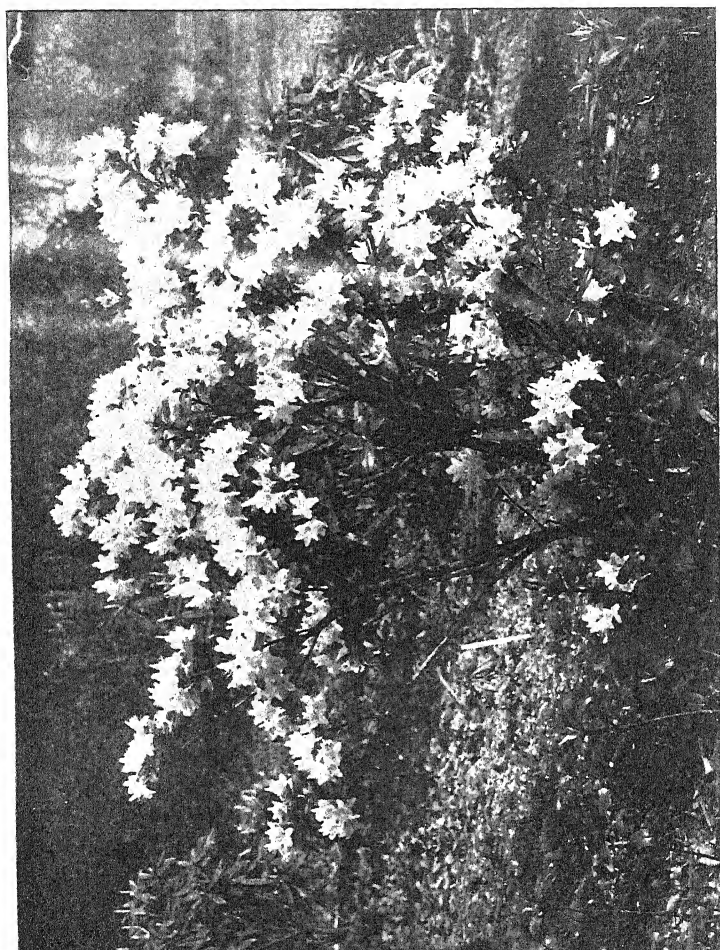


FIG. 69.—RHODODENDRON CUNEATUM.

THE FORCING OF BULBOUS PLANTS,
BEING AN ADDRESS TO THE WISLEY STUDENTS

BY

THOMAS STEVENSON, F.R.H.S.,

I DO not think it is intended that I should go into the subject of bulb-growing generally, but rather that I should confine myself to the forcing of Narcissi, Early Single and Double Tulips, Darwin Tulips, Irises, and Gladioli under glass, with the view of raising a discussion, or eliciting a volume of questions, from which I think more valuable information is obtained than in any other way.

Generally speaking, I think growers, and especially those who do not force bulbs year in and year out, believe bulb-forcing to be a very simple matter; it is not so! It is probably the most hazardous of all phases of horticulture, though I must say it is intensely interesting, and, in the case of early Tulips and Daffodils, once the bulbs are introduced into the forcing-houses very few days elapse before one realizes the results of his labour, good or bad.

At the outset I would point out that great advances have been made during the past fifteen or twenty years in the growing and forcing of all kinds of bulbs, and whether it is this progress which has created the great demand for forced bulbs, or the demand has been responsible for the progress, I am not in a position to say; but the fact is there is now a great demand for forced bulbs of all kinds, and it certainly is one of the subjects that any young man thinking of embarking in business should give his attention to.

It is well within the memory of even much younger men than I when only such subjects as Hyacinths, Single and Double Tulips, certain varieties of Daffodils or Narcissi, and *Gladiolus Colvillei* were forced in quantity; now we have a much wider range—*Lilium longiflorum* and *L. speciosum* and Lily of the Valley we have all the year round, Hyacinths and early-flowering Tulips over rather a longer season than formerly, and Darwin Tulips for about five months.

I think we owe the credit of the advance in Darwin Tulips to the efforts and experiments of the late WALTER T. WARE, of Bath, and this year, probably for the first time, the Darwin or late-flowering Tulip, 'William Copland,' was on sale fairly early in December. Mr. J. DE GRAAFF, of Leiden, I believe, first noted the forcing merits of 'William Copland' among a collection of Darwins and other varieties that were being tested in Holland; then it was a variety not very well known, and certainly not procurable in any quantity. Now its great popularity may be gauged from the fact that it is forced in great quantities by everyone who handles Darwin Tulips, and this year my firm alone has nearly 750,000 of this variety.

Gladioli also cover a very much longer season. We have for many

years looked upon the Nanus types as early-flowering subjects under glass, but it is only during the last few years that we have really forced the Primulinus and larger flowering types. About five or six years ago a few very anæmic spikes of the variety 'Prince of Wales' were shown at the Chelsea Show and this was considered very early indeed; now we realize that it is comparatively easy to get not only 'Prince of Wales,' but several other varieties, in bloom by about the middle or end of May, and some of the varieties of Primulinus may be had in bloom as early as the end of April.

Irises are also very popular, but these, with the exception of *I. tingitana*, are not amenable to much forcing. The variety mentioned, however, can be forced into bloom very early if bulbs are secured from a district where the heat is very great, and the bulbs pretty well baked after ripening; but it has proved in many seasons so very disappointing in the percentage of flowering bulbs that it has fallen from favour, and the only really *first-class* flowers we get of this variety are imported from the South of France. Still Irises too are being vastly improved, and it is quite probable that we may soon have a free-flowering type of Iris, known as Dutch, that is larger in the bloom than the Spanish and *filifolia* type, and earlier blooming.

A variety named 'Wedgwood,' probably a cross between *Xiphium* and *tingitana*, owned by my firm and grown at our farm at Haamstede in Holland, is probably from four to six weeks earlier than the *filifolia* type, and we have great hopes of it being the forerunner of a really free and early-blooming type which will stand fairly hard forcing.

Still, as I mentioned a little earlier, all bulb-forcing is a somewhat risky job, and no one should take on the early forcing (in quantity) of any kind of bulb without first making experiments with small lots, or having had experience in a really successful bulb-forcing establishment.

Many years ago—at least thirty—I was foreman in an establishment where the lady was particularly fond of forced bulbs; here we grew, in pots, more kinds and varieties of bulbs than I have ever seen since, and depended entirely on these subjects for our supply of flowers, cut and otherwise, through the winter and spring months, and this probably gave me more than an ordinary interest in the subject of bulb-forcing.

Many of the failures that occur in the forcing of bulbs may be due to the fact that it is impossible for one to determine their forcing qualities beforehand. True, one knows that for very early work one must get Daffodils either from France or the Channel Islands, but sometimes even these are disappointing. A little overripening, too quick drying, a little delay in getting them into their pots or boxes, too hot a position in the hold of the vessel for a day or two, or being bagged a little too damp, all have their influence on the forcing qualities; and as the grower in most cases is not aware of any of these unfavourable conditions he has to go blindly on, just using his judgment.

The district from which the bulbs come has a very marked effect on their forcing qualities, and though you may know the district as

an early or late one you are very little better off, for while in one year the bulbs from one or several districts may force well and easily it does not by any means follow that they will do so the following year. This we have proved over and over again, so that each succeeding season the grower or forcer has full scope for his deductive abilities, and if he gets through the season without a serious slip up he has reason to congratulate himself, not only on his skill but on the luck that has attended his efforts.

The first step towards success is to secure good-quality bulbs of about the right size and weight from a really reliable source—where the grower has paid more attention to securing the best forcing properties in the bulbs than to their actual appearance. The forcer is not a bit particular as to the colour of the skin, or whether it is broken or not ; and though it may be necessary to subject some or all classes of bulbs to a certain amount of heat to ensure their hardness for packing and travelling purposes, I feel sure that bulbs dried quite naturally and somewhat slowly are the best for forcing purposes generally. A little too much heat at certain times will, we know, detract from their forcing qualities, though possibly the right amount at another time will benefit them, but as the effect in different seasons is not the same it is safer to start work on bulbs that have been just normally treated.

The soil for forcing bulbs—Tulips and Irises especially—should be quite free from contamination, and not have had any other bulb crop in or on it for at least three or four years. This is very easy with only small quantities of bulbs, but where very large quantities are grown, or much soil required annually, it is more difficult. Bulbs generally are not very impatient as to the class of soil they are forced in, though if it is of a light porous nature certain advantages are derived.

Tulips and Hyacinths are very tender-rooted subjects, and to minimize as far as possible any trouble in this respect no fresh manure of any kind should be included in the compost.

Daffodils and Narcissi are much stronger rooting, and though it is not necessary to add manure to the soil a little might do no harm.

Irises and Gladioli are not forcing subjects in the same terms as applied to the above, and are more dependent on their rooting system, hence the need for rather a better class of compost, slightly enriched by the addition of well-rotted manure ; but even here it is better to use little in the compost, and depend more on watering during the period of growth with liquid cow manure, if anything is necessary.

Boxing or Potting.

The question of boxes or pots naturally arises. Where the bulbs are wanted for decorative purposes in pots there is no option. Where they are being forced for cut flowers in larger quantities, one can at once say that for all early-flowering Tulips and Daffodils boxes are

preferable, first on the score of economy, and secondly because of greater ease in handling, and in many cases they do as well or even better than in pots.

For Darwin Tulips and Irises it is an open question, and if carefully handled they do well in either, but where quality of bloom and stiffness of stem are the chief points aimed at, then I think that No. 16 pots are the best ; and rather a better percentage of bloom is obtained from these, though I must say that on examining big batches growing in pots and boxes one would give the palm to the boxes, until the blooms are cut and the waste counted.

Gladioli, I think I can say at once, give the best results when grown in pots—No. 16 or No. 12 for preference. Gladioli do not like wet or too moist conditions over too long a period, hence the better results from pots, for the pots dry out more quickly.

Dates of Potting or Boxing.

The dates of potting or boxing the different kinds of bulbs naturally vary.

Taking the *Narcissi* first—these should be boxed fairly early in the season, say, any time from the beginning of August, and it should be noted that the *Poeticus* family cannot be boxed too early after being lifted, as they naturally have a very short dormant season, the fresh roots being emitted from the base of the bulbs sometimes even before the old roots have quite dried up, and once the tips of these roots are damaged they cease to function, and the bulbs are dependent on any fresh roots that appear.

Tulips generally do not require boxing or potting so early, and it should greatly depend on the date at which they are to be in bloom ; but for very early forcing, to make quite sure of the best results, they should be in the soil by about the end of September, and potting or boxing may be carried on at varying dates up to Christmas.

Irises also require to be got into their flowering receptacles fairly early, September and October being about the right date ; in a damp season they soon commence to root out, and, after a certain date, any undue heat to keep the atmosphere dry enough to prevent the bulbs rooting out only tends to lower their vitality, and weakened growth is the result.

Darwin Tulips should in most cases be potted or boxed between the end of September and middle of November, choosing the earlier date for very early flowering varieties, and following with the later ones.

In no case is it necessary to make the soil very firm for bulbs ; in fact, the bulbs are best just placed on quite loose level soil, covering these about one inch in the case of *Irises*, and only partially covering *Tulips* and *Narcissi*, pressing this down only lightly ; if the soil is pressed firm below the bulbs they will in most cases lift themselves out of the soil as they make root.

When boxing any kind of bulb, say, between August and November, it is wise to give them one pretty good watering in, and as soon as the surface is fairly dry cover them with an inch or two of clean ashes, or, if these are not obtainable, light litter will serve the same purpose—i.e. to keep the bulbs from lifting and to keep them cool and moist. During very dry weather it may be wise to keep the ashes or straw heavily sprinkled two or three times a week, as once the bulbs commence rooting (which they will do very quickly) it is very detrimental for them to get dry.

After November, providing the potting or boxing soil is fairly moist, this watering in is not necessary, though a sprinkle over the surface to settle the soil makes it easier to remove the ashes when the time comes to place the bulbs under glass for forcing purposes.

Nanus Gladioli should be boxed or potted fairly early in the season, but I do not advise that these be covered with ashes, or any other covering, as the foliage invariably becomes tipped towards the date of flowering if covered with anything except the soil. All Gladioli are very susceptible to damage by frost, so after potting they should be placed in a cool house, or under lights, where they may be protected from frost.

The larger—flowering varieties—*gandavensis*, *Childsii*, and *primulinus*—do not require potting anything like so early, and in this case from mid-December onwards is quite soon enough. These also should be placed under glass, and not covered with ashes as are Early Single and Double Tulips, Narcissi, etc.

There seems to be no very real advantage in potting these early and giving them quite cool conditions as with most other bulbs; they seem to appreciate moderately warm growing conditions quite from the date they are potted—by this I do not mean that they require a temperature of 60° F., but, say, 45° F. to 50° F. at night, increasing it as growth advances.

The conditions governing the forcing of the different kinds of bulbs vary considerably, and as far as I can in a limited time I will try to touch on a few of the essentials.

Tulips may be fairly successfully forced in almost any house where the correct temperatures can be kept up, though a house with stages, or raised beds, is probably the best; if there is command of bottom heat, this will greatly facilitate matters, and is almost, if not quite, a necessity for very early forcing—say, for Christmas and the first two or three weeks in January. A steady temperature from 66° to 72°, or in some cases 75°, is about right for this date, and to secure length of stem for the very early batches heavy shading will be necessary until the blooms show colour, when it must be gradually removed, in order to secure texture and colour in both bloom and foliage. As the season advances less shading will be necessary for the succeeding batches, and a lower temperature will be required, but no definite rule can be laid down—the forcer must watch the growth and judge thereby the amount of heat required so as to secure the best colour

in both bloom and foliage. If too much heat and moisture have been used the foliage will be too large and soft, and the bloom small in comparison, while the keeping qualities will be greatly impaired. A well-forced Tulip should have stiff small foliage, with the flowers, as it were, resting just clear of the foliage.

During the period of forcing the bulbs must not suffer for want of water at the root, and frequent overhead sprayings must be employed to keep up the necessary humidity. Later in the season bottom heat is not so necessary, and may be quite done away with, and as the necessity for so much fire heat decreases the amount of humidity in the atmosphere also can be decreased; for while in the early part of the season no trouble is experienced by what is termed spot in the bloom, later it becomes quite a menace in some varieties where improper methods are employed.

Generally speaking, three weeks should be allowed for the early batches from the time they are introduced into the houses till the blooms are fit to cut; later batches of Singles will go through the houses in about a fortnight, while the Doubles will at all times take three weeks, or a little more early in the season.

Narcissi, or Daffodils, as a rule, take longer in forcing than do Tulips, especially early in the season, and it is not safe to introduce them into the houses till, say, the 7th of December—this applies, of course, to the early varieties, such as 'Golden Spur.' It is safer to keep such varieties as 'Ornatus,' 'Victoria,' 'Sir Watkin,' 'Barri Conspicuous,' 'King Alfred,' etc., etc., in the open air till, say, the end of December. True, many people put these into heat earlier than this, but the results are not generally so good, and the risks run are not warranted by the quality and percentage of bloom obtained from such early housing, especially in these days of very expensive bulbs. 50° F. to 55° F. is about the right temperature to give at night for about a week, when it may be raised to from 60° to 65°, but this is the maximum night temperature that should be given to Narcissi at any time, and the former would give the better results where quality was the first consideration.

I have found in practice that better results are obtained from Narcissi forced on solid beds or on the ground than when the boxes are placed on stages. This shows that they are very impatient of heat at the root. They seem to enjoy very much more water at the root than do Tulips.

Darwin Tulips are now very popular, and the tendency is to try to get them into bloom too early, there being very few varieties that are amenable to what one would term forcing temperatures.

'William Copland,' however, will stand almost as much heat as the early Dutch varieties, and may be treated in much the same way. Allowing about three weeks in a temperature of 60° to 65° for the early batch or batches to flower, they may safely be had in bloom by the middle of January.

Most of the other varieties, however, after housing are best treated

on much the same lines as *Narcissi* as regards temperatures ; they do not require the same amount of water as *Narcissi*, but they should never be allowed to get very dry—this, together with too much heat, will tend to blindness to a greater or lesser degree, according to the variety or natural strength in the bulb. Here again the early batches will be benefited by spraying overhead, but as the season advances it can to a certain extent be discontinued, too much atmospheric moisture only adding to the size of the foliage without any added stiffness to the stems and quality in the bloom.

Irises probably are more difficult to flower successfully under glass than either of the preceding subjects, and as before mentioned have to be grown rather than forced. I do not think that anything is gained by getting them under cover (and certainly there should be no anxiety to do this) before the end of the year, though in moist growing seasons considerable growth is made out of doors. Frost will not damage either the roots or the foliage, though very cold drying winds are apt to turn the leaves brown, but this does not usually affect the quality of the bloom.

Irises generally, I think, should be acclimatized somewhat to under-glass conditions before turning on any heat whatever, and during the dull cold months of January and February a night temperature of 50° is sufficient, raising it to 55° , and eventually to 60° , when quite sure that the bloom is coming.

Immediately after housing very little water will be required at the root, but it does not follow that the soil should be allowed to get really dry, and spraying overhead should be practised on all really bright days, so as to counteract as far as possible the great change from outdoor to indoor conditions. Later on, of course, they will require considerable attention as regards water at the roots, and towards the flowering period, say April, they may need it twice a day. Irises make a very considerable amount of root, when compared with the size of the bulb, and it may assist them considerably if they are given a watering with liquid cow-manure, say, once a week, during the later stages of growth, but on no account should artificial manure be used.

Gladioli, as before stated, should be potted or boxed and placed direct under glass, and kept free from frost until growth commences, when the heat may be gradually increased in about the same ratio as for Irises—this applies to all classes.

Naturally the earlier potted *Nanus* varieties will want heat first, as growth will be in a more forward condition, and, generally speaking, they will flower earlier. But with all the *Gladiolus* family it is inadvisable to push them too fast, and this one is very apt to do when the plants appear to be strong and healthy ; the critical period is just when they are forming their flower spikes in the young growth, when too high a temperature, too much or too little water, will all tend to check their proper development.

It is the same all through with the forcing and flowering of bulbs

under glass; the line of safety is so easily exceeded, and one rarely, if ever, realizes that anything wrong has been allowed to happen until it is too late—what may appear to be a really promising batch of bulbs one week, or for weeks after the check has occurred, eventually turns out to be a dead loss.

I have not spoken of the ventilation in connexion with any of these subjects, and very early in the season it is more a matter of conserving all the heat rather than letting it out through the ventilators; but later in the season, as the sun gains strength, even in the forcing-houses air has to be given, but it should be given judiciously, never allowing a cold draught to reach the plants, and only sufficient to regulate the temperature.

The Darwin Tulips, Irises, and Gladioli, being grown at rather lower temperatures, will naturally require more attention in respect to ventilation, but if the houses are kept at what would be considered the right condition for young soft-wooded plants, such as Fuchsias, Cannas, Coleus, etc., etc., they will do well, bearing in mind the fact that the more air that can be given, consistent with keeping the temperatures and atmospheric conditions correct, the better quality will there be in the flowers.

This I know to be a very crude résumé of the many intricacies of bulb forcing and growing—it is a subject that could not be thrashed out properly in a week, much less in an hour or two—but I trust that I may at least have given a few pointers and left sufficient openings for a thoroughly good discussion.

TULIPS

Whites

White Duc Maxima
La Reine

Pelican
Boule de Neige

Diana
White Swan

Pinks

Le Matelas
Rosina
Rose Aplatie

Gris-de-lin
Murillo

Lucretia
Rose Luisante

Yellows

Mon Trésor
Yellow Prince

King of the Yellows
Rising Sun

Van der Hoeff

Reds

Brilliant Star
Vermillon Brillant

Cramoisie Brillant
Vuurbaak

Couleur Cardinal

Other Colours

Fred Moore
Prince of Austria
Couronne d'Or

Tea Rose
MacKinley
Van der Neer

Wouwerman
Le Rêve

DARWINS AND MAY-FLOWERING TULIPS

William Copland
William Pitt
Bartigon
Harry Veitch
Afterglow

Clara Butt
Parisian White
Baronne de Tonnaye
Princess Elizabeth
Le Nôtre

Farncombe Sanders
Inglescombe Yellow
Greuze
Geefs
Bouton d'Or

DAFFODILS, OR NARCISSI

Golden Spur	Van Sion	Emperor
Princeps	Poeticus Horace	Walter T. Ware
Barri Conspicuous	Victoria	Poeticus Ornatus
Sir Watkin	Empress	Soleil d'Or
King Alfred		

IRISES

Filifolia varieties	Belle Chinoise	King of Whites
Imperator	Anton Mauve	Flora
Comte de Nassau	Louise	Cajanus
Hart Nibbrig	Queen Wilhelmina	Blanche Fleur

GLADIOLI—NANUS

Ackermanni	Colvillei Albus	Peach Blossom
Flores	Blushing Bride	Admiral Togo
Brilliant		

GLADIOLI—PRIMULINUS

Hermione	Sun Queen	Niobe
Atalanta	Salmonea	Juno
Souvenir	Maiden's Blush	Rosaurea
Alice Tiplady	Orange Brilliant	Scarletta

LARGE-FLOWERING GLADIOLI

White Giant	Vesuvius	Catherina
L'Immaculée	Panama	Mr. Mark
Maréchal Foch	Schwaben	Red Canna
Brimstone	Prince of Wales	Mrs. Velthuys
Early Sunrise	Halley	Willy Wigman
Pink Perfection	Odin	Proserpine

HYACINTHS

L'Innocence	Roi des Belges	Schotel
Lady Derby	Arentine Arendsen	Yellow Hammer
La Victoria	Grand Maître	King of the Blues
La Grande	Moreno	Baroness Van Thuyll

THE GARDENS AT BODNANT.

By the Hon. HENRY McLAREN.

THE gardens at Bodnant enjoy neither the mildness nor the moisture of Cornwall and the Western Isles, nor the hot and ripening sun of the South of England.

The annual rainfall is about 30 inches, and some 15° of frost is no exceptional experience, while a low record of 27° marked the winter of 1917. We are, however, very often spared the severe late spring frosts which afflict gardens in the south.

East winds, fortunately, trouble us little. Much of the ground, however, is exposed to the prevailing winds from the south-west.

The soil tends to be heavy (not the worst of faults where sloping ground helps the drainage), but it is quite free from lime.

The site of the gardens is naturally a beautiful one ; it is above the tidal river Conway, and slopes towards the south-west, with views of river and mountain across the valley towards the Snowdon Range. Nature, too, has endowed the gardens with abundance of running water, while generations long past have preserved the native forest trees.

The gardens consist of two portions: the upper one round the house, partly terraces and partly formal lawns shaded by large trees ; and the lower portion, known as the Dell, formed in the valley of the little river Hiraethlyn, a tributary of the Conway.

The terraces were not included in the original scheme when the gardens were laid out in 1874 and the following years. It was then that the lawns were made, and there were planted round them some good groups of hardy shrubs, evergreen and wind-proof, such as hollies, hardy hybrid Rhododendrons, Berberis, Veronicas, and Phillyreas, with Junipers and other conifers. Among the latter some half-dozen *Cupressus Lawsoniana* var. *erecta viridis*, planted round a formal boxed Dutch garden, have proved the most ornamental and, although in an exposed situation, have reached some 45 feet in height.

In later years, however, it proved rather difficult to add to these any of the rarer or more tender shrubs, for the lawns were somewhat wind-swept and, even if this had not been so, to have planted them further would have spoilt their character and destroyed all sense of repose.

It was therefore decided some twenty years ago to terrace the western slope ; and these terraces with their retaining walls have provided sites for flower borders and rose beds, for climbers and half-hardy shrubs, sites suitable both for the welfare of the plants and in that they tend to fall quietly and appropriately into the general scheme.

When one has had experience of both it is easy to see why the garden architect prefers the formal or the terraced garden to the landscape or the wild garden. In the former it is difficult to place a plant so that it does not look well and thrive, and, moreover, the scheme reaches almost its full beauty in three or four years; in the latter success can only be achieved by the greatest artistic and cultural skill, and the garden takes nearly a generation to mature.

The brightest of the Bodnant terraces is one devoted to a rose garden suggested by, and somewhat on the same lines as, the beautiful flagged rose garden at Gravetye.

The beds have raised flag edges and the paths between are flagged. The roses are planted fairly closely in the beds and tulips grow between them; round the edges of each bed, coming over the flag edges and on to the paths, grow *Lithospermum*, creeping *Phlox*, pinks, dwarf silver-leaved *Artemisia*s, and other similar plants.

In spring the roses are pruned to the ground, and the whole is gay with tulips and spring flowers; as the tulips fade the rose growths cover their dying leaves, and from June till the frosts come the roses themselves carry on the colour, framed by the green and silver foliage of the rock plants.

A lower terrace is devoted to a formal pool, some 20 yards by 40 yards, wherein is grown a collection of hybrid water-lilies. They are replanted at least every other year, an essential point in their cultivation if one wants flowers that float, and not a mere mound of leaves; and although the centre is left clear to show the water, nearly a thousand blooms have been counted open at one time in June—a great feat for plants that flower continuously for four months on end.

Of these *Nymphaeas*, *colossea* is, to my mind, the finest, with very large blooms of ivory tint just touched with pink, while of those of deeper colour I like the free-flowering 'James Brydon,' *gloriosa* (if one can keep it), and *lucida* with its handsome mottled leaves and star-shaped flowers.

The chief interest, however, of the terraces is, perhaps, the shrubs that have been planted against the walls. As the drop in level is considerable there are successive retaining walls of heights of seven, ten, fourteen, fifteen, and four feet—the highest two being buttressed. Although all these walls face west, the buttresses give not only increased shelter, but a certain variety of aspect which enables half-hardy plants to be tried both in sun and shade.

After some experience of these and other walls I have come to the conclusion that, face it north, south, west or east, a wall remains the best of helps to any shrub of doubtful hardiness or vigour, and that most such shrubs in the North Wales climate pay but little regard to the precise aspect as long as the wall is there.

One of the best of wall shrubs is an exception. The evergreen *Eucryphia cordifolia* thrives only on a quite sunny wall, and there it will grow rampantly—as much as three feet of growth having been

observed in one year. Its near relative, the deciduous *Eucryphia pinnatifolia*, needs no wall with us ; it is a shrub that should be more planted, for when once it starts to grow (and pot-reared plants often refuse to grow at all) it never looks back, and cares not whether the soil be dry or wet, light or heavy, or the position sheltered or exposed. Its flowers in late August are the glory of the garden, and its colour in November is almost unsurpassed.

Magnolia Campbellii was planted both on a sunny and a shady wall ; both plants thrive, but only the one on a sunny wall has flowered. For sixteen years it only grew ; it topped the 10-foot wall by almost as much again, and then one March it flowered. It was, perhaps, the most wonderful sight an English garden can produce—fifty flowers on leafless boughs—scented, waxy, globular, semi-double, bright pink, and ten inches each across ; before they fell, a snowstorm came and left them unscathed.

Another fine wall shrub on the terraces is *Buddleia Colvillei*, with its drooping racemes—one may have it in either pink or claret shades. It grows up the wall and then comes forward at the top : a welcome change from the majority of shrubs, which are bulky at the base and spindly at the finish. It is a shy flowerer at first, but mends its ways as it grows older.

Camellia reticulata does well on the shady side of a buttress and equally well when it comes up over the top into the sun ; with its 5-inch semi-double flowers of carmine-rose it is pre-eminent in bloom over all Camellias, and on a wall the easiest to grow.

Embothrium coccineum in either sun or shade, on the wall, has proved a hardy plant, hardly touched by 27 degrees of frost ; but again beware of the pot-bound plant, which never starts to grow.

Solanum crispum var. *autumnale*, perpetual-flowered (even in winter, when it is a mild one), is a fine plant, although it cannot quite shake off the resemblance in flower to its vulgar cousin the mauve-flowered potato. *Solanum jasminoides* abandons the colour but partakes somewhat of the tenderness of that vegetable, and cannot with us be regarded as a long-lived plant. It is, however, propagated so easily and grows so quickly that there is no excuse for not having it in any district where there is a chance of it standing a mild winter.

Another striking plant on the terraces is *Crinodendron Hookerianum*. This will grow against a north wall, but flowers even better when it gets some western sun ; 27 degrees of frost cut it back slightly, but did the plant no permanent injury. Of the myrtles, *Eugenia apiculata* is far the best ; it is a stronger grower than the common myrtle and more free flowering ; but above all it starts to flower in good time, in July, and has opened almost all its buds by October, while the common myrtle waits until mid-September and only has time to open a small proportion of its buds before the frosts come. Again, the shoots of the common myrtle do not ripen sufficiently to withstand a moderate frost, and the plant tends to look shabby all the winter and spring. The *Eugenia*, however, with its earlier growth, is untouched by moderate

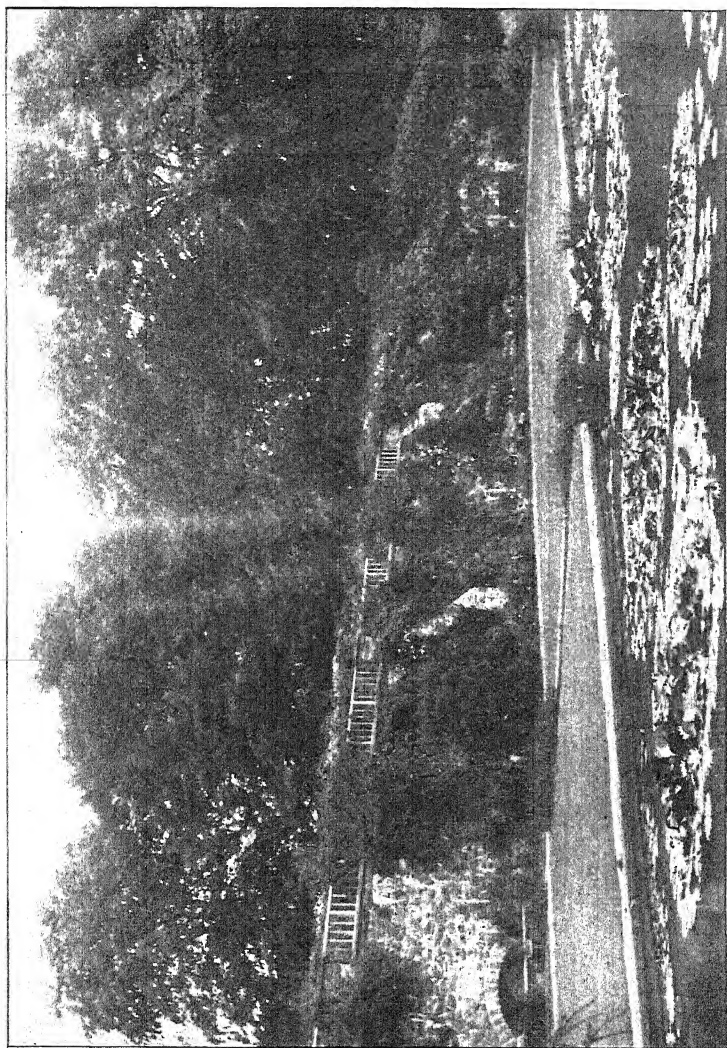


FIG. 70.—IN THE GARDENS, BODNANT.

To face p. 242.

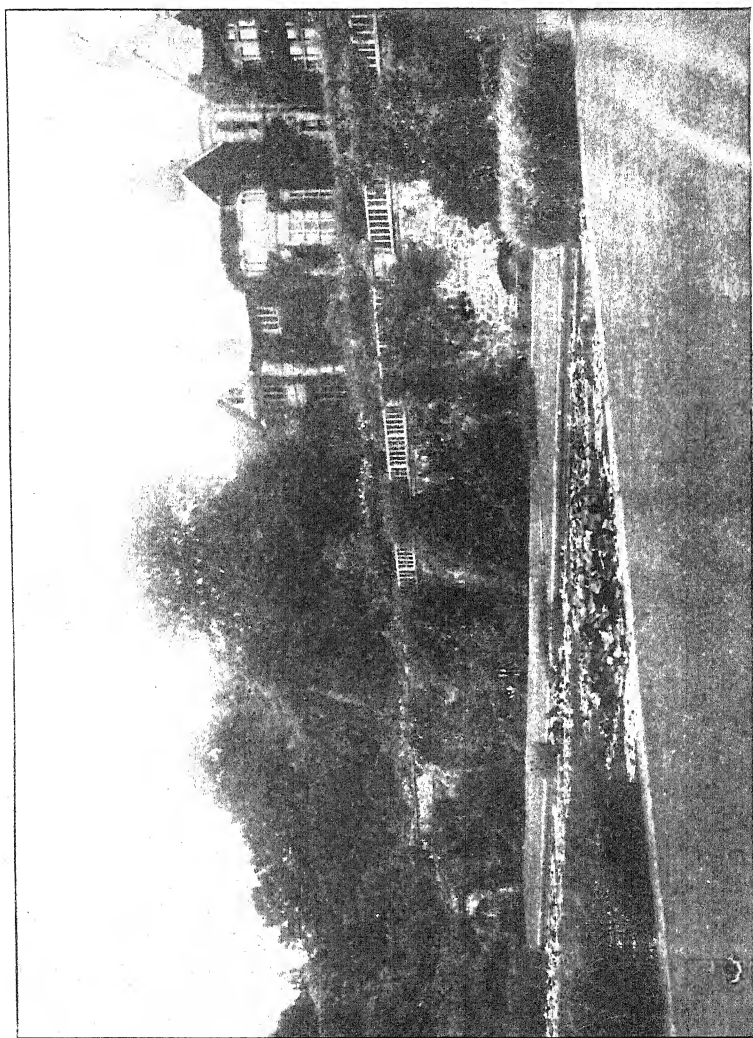


FIG. 71.—IN THE GARDENS, BODNANT.

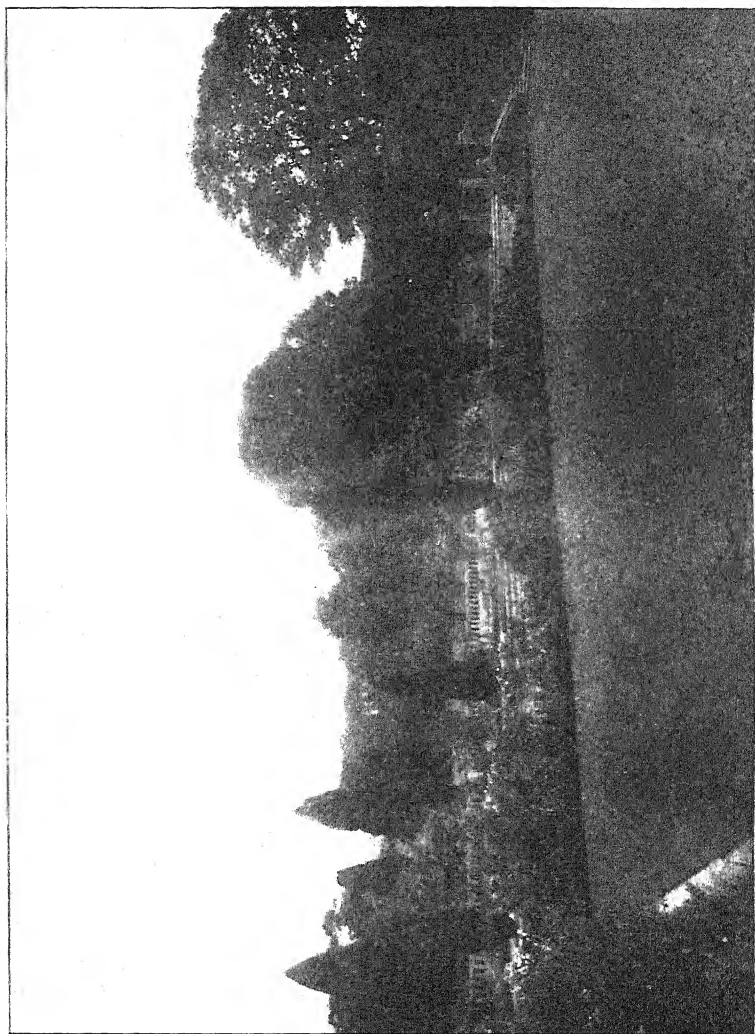


FIG. 72.—IN THE GARDENS, BODNANT.

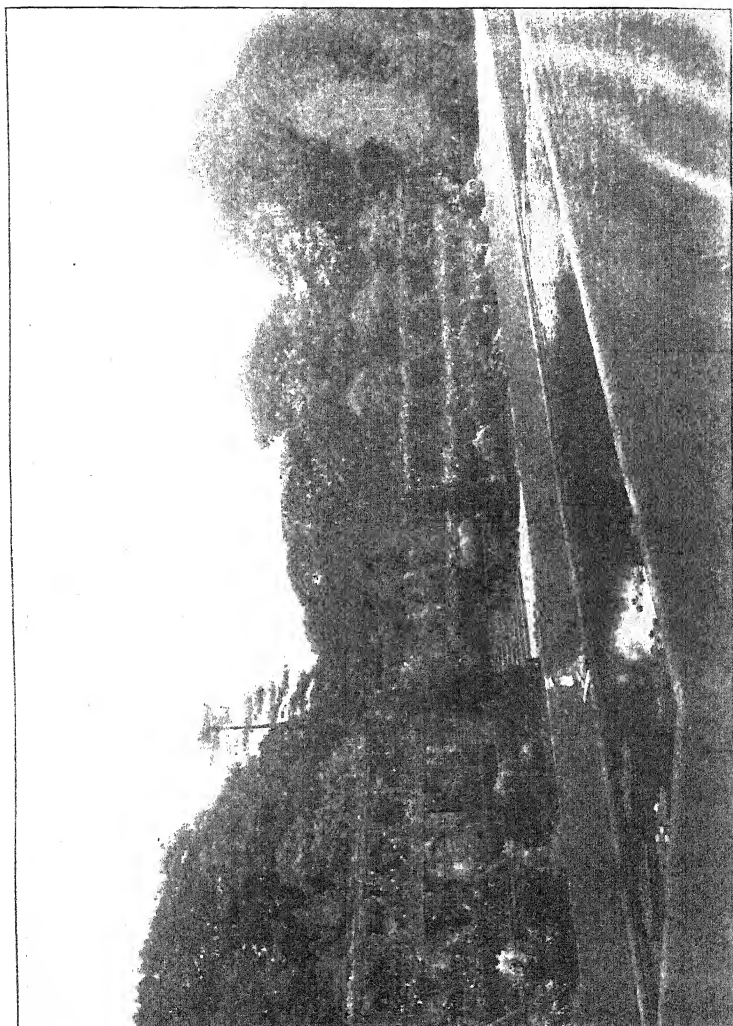


FIG. 73.—IN THE GARDENS, BODNANT.

[To face p. 213.]

frost, although the frost of 27 degrees damaged these plants more than it did the myrtles.

Of the other shrubs that clothe these walls I would mention *Magnolia Delavayi*, magnificent in leaf but disappointing in its flowers, which are sparingly borne and soon over; *Eucalyptus whittinghamensis*, with striking silver foliage and strange flowers; *Desfontainea spinosa*, the "carrot holly" of the children, tolerant of a north wall, but the better for a bit of sun; *Rhyncospermum jasminoides*, one of the most fragrant of all flowering shrubs, and its ally the more tender *Mandevilla sauveolens*, with fragrant flowers and long seed pods, a plant cut to the base but not killed by 27 degrees of frost; *Erica australis*, the best but not the hardiest of the tree heaths; *Hydrangea hortensis*, blue (with some little assistance); and finally *Fuchsia Riccartonii*, planted chiefly in holes left at the top of the higher walls.

On the lesser walls, both on these terraces and elsewhere, are grown as well on trial a range of plants of doubtful hardiness—some stay, some struggle, some go; but it is wise not to give up hope of growing a good plant after but one failure—a well-established plant will pull through a hard winter very often when a newly planted one will not. With this in view April is the month when we plant or replant the walls; this work is never done in autumn or in winter.

The lowest terrace has a formal canal, used as a bathing pond, excavated in stiff stony boulder clay; this material was thrown out to form a steep slope facing west down beyond the yew hedge that bounds the terrace. In this inhospitable material, which sets so hard that no spade will penetrate it, a number of sun-loving plants thrive amazingly—*Cistus*, Spanish Broom, *Fuchsia* and *Escallonias*, while among them *Eschscholzias* seed themselves: a lesson that no soil is too bad to support some good plant if the choice of plant happens to be right.

Beyond the terraces a slope clothed with native forest trees falls steeply to the Dell, a hundred feet below. The tidal waters of the Conway flow a couple of hundred yards up the stream. They are stopped by a rocky ledge near the old mill, built some 125 years ago by an unknown architect who must have studied to good purpose the more simple buildings of Northern Italy. Where the tideway ends the garden of the Dell begins. For a quarter of a mile or so a rocky winding stream with swift and broken current and a placid formal millrace flow in parallel courses along the closely mown lawns of the flat bottom of the little valley. Here grow the oldest of the conifers.

It was in 1876 and the following years that this collection of conifers was planted beside the stream, an admirably chosen site. Among them the most imposing to-day is an *Abies grandis*, 100 feet high; the tallest conifer is a second *A. grandis*, 110 feet high, though only planted in 1888. For rarity and vigour perhaps the most noteworthy are an *Abies bracteata*, branched to the ground, planted in 1890 and now 77 feet high, and a *Sciadopitys verticillata*, 21 feet high;

while there are good trees of *Tsuga Albertiana* (planted in 1886, now 86 feet high), *Pinus Bolanderi* (perhaps more correctly known as *P. contorta* var. *Murrayana*), *Abies Pinsapo*, *A. cephalonica*, and *Sequoia sempervirens*.

These trees have prospered because they have had a very exceptional situation—deep alluvial soil in a well-watered valley with perfect shelter from the wind ; only in such a place will the Californian silver firs really do well for any length of years. May the new ones from China prove more accommodating !

As we leave the conifers the valley narrows, and we reach the mill pond with its 15-foot dam over which the water pours with a dull roar that forms a bass to the treble of the stream itself and to all the other garden sounds.

The mill pond here fills all the width of the valley bottom, and is overhung by hardwood trees growing on the rocky slopes that bound it, except where a smaller tributary stream falls into it in a cascade over a long slope of moss-grown rock. At the upper end of the pond the valley is shallower and more sunny, the slopes more gentle and the native trees are fewer ; here the opportunity was taken some twenty-five years ago to plant a wild garden of trees and shrubs. The project was to add further specimens to the collection of conifers and to surround them with an undergrowth of flowering shrubs.

The soil being poor and the site somewhat exposed, pines were planted more freely than silver firs, and of these *Pinus insignis*, *P. muricata*, *P. Ayacahuite*, *P. Montezumae* and *P. Coulteri* have proved the most ornamental, and in many ways are undoubtedly far better garden plants than their cousins the Californian silver firs, the spruces and the Douglas fir.

The ornamental trees were spaced widely apart, for this was no experiment in forestry, and we wished each of these trees ultimately to stand free by itself. But even the pines required nurses in their growth, and so the outside edge of the plantation and the windier places were planted up more thickly with birch, Corsican and Scots pines and larch between the permanent trees. Where nurses were not required the vacant space was planted with *Pernettya*, *Gaultheria*, *Escallonia*, *Forsythia*, heaths, *Andromeda*, *Azalea*, *Garrya*, rose species, *Cistus*, *Viburnums*, *Buddleia*, *Berberis Darwinii*, the new deciduous Chinese barberries and other flowering shrubs. A broad ride of mown grass gives access and place is found among them for daffodils and other bulbs.

Before the planting was done the ground was deeply ploughed and afterwards the grass was allowed to grow again.

To the debit side of this kind of gardening must be placed two facts—firstly, that but few of the shrubs grow as freely or so large as they do in a trenched and well-tilled bed ; and secondly, that for the first fifteen or twenty years one may have the promise of a beautiful garden but one has not the thing itself.

To the credit side must also be placed two facts—firstly, that the

cost of upkeep is negligible (an afternoon a week mows the ride, the longer grass among the trees almost pays in hay for its cutting once a year, and the thinning and pruning is but a small matter), and secondly, that the plants themselves have interest from the first—at any rate to the planter.

Let us turn now to the sides of the Dell where the older hardwood trees already stand. Here it is to Rhododendrons that we look to give the garden interest; from 1909 onwards an ever rising tide of this wonderful genus has invaded the wild garden at Bodnant—Himalayan species, Himalayan hybrids, Chinese species, few come amiss, and still they come! Given a lime-free soil, the shelter of open woodland (trees all round but sky overhead), a trenching with some leaf-soil dug in, and little remains but to enjoy the flowers from February to June, and to move out the plants when they grow too crowded. Nothing has given more interest to the garden with less expenditure of labour than Rhododendrons.

In recent years the “hardy hybrid” Rhododendrons, beautiful as many of them are when in bloom, have been but little planted, because they flower too much at one time, and because they have less beauty and variety of form and leaf than the Himalayan and Chinese species and their primary hybrids.

One of the chief plantings of Rhododendrons has been made on the side of the Dell, on a steep slope facing north-east (and therefore sheltered from the prevailing winds). This slope was a field till 1895, when it was planted with *Cupressus Lawsoniana*, wild cherries and *Rhododendron ponticum*, with a shelter belt of Corsican pine on the outer edge.

In recent years the ponticums have been so cut away from the paths as to form merely a background in front of which the finer Rhododendrons have been planted, some in trenched beds, some merely in holes. A special feature here is made of ‘Loder’s White’ and ‘Penjerrick,’ the latter a beautiful hybrid between the yellow *R. campylocarpum* and the tender *R. Aucklandii* or *Griffithianum*.

In this planting the ponticum is all-important, not so much for the shelter and warmth it gives but for the quiet uniform background, which a mixed planting of Rhododendrons must have if it is to look at all well. The ponticum flowers later than the others, and there is thus no clash of colour.

Another planting of Rhododendrons has been made in a little side valley which a smaller stream, tributary to the Hiraethlyn, has worn down in places to the solid rock; this little valley is a shallow one, wooded with great oaks, closely under-planted some thirty-five years ago with English yews. The oaks have now been thinned, and two-thirds of the yews have been cut away, leaving a high evergreen edge to the valley, with belts of yews and isolated yews occupying some of the centre. Again we have the essential background, and yew is a finer background on the whole than *Rhododendron ponticum*, taller yet not so spreading, and finer in its contrast of light and shade.

In trenchings in the clearings many of WILSON's large-leaved Chinese Rhododendrons have made good growth, although in a wet stiff soil that one would now be inclined to avoid. *R. auriculatum* and *R. discolor* are the tallest of these, reaching 10 feet, while *R. sutchuenense* and *R. oreodoxa* are not much smaller. The ground between the Rhododendrons is covered with Primulas, Hypericum, Spiraeas, London Pride, and the native Luzula (or wood rush).

But among the Chinese Rhododendrons of later introduction are races that come from mountain tops and do not care for woodland, that hate stiff soil, and that from their small stature seem to demand more care than they would get in a large trenching. For these a special rocky bed has been prepared on a slope facing north-west in a fairly airy and open situation, though shaded partially from the south. Some fair-sized rocks, debris from a cliff, have been placed upon the ground, running in rough level lines across the slope. The ground between them has been thickly strewn with flat stones placed on edge, and on the latter has been spread what we imagine (perhaps erroneously) to be the most suitable soil that can be mixed: two parts of leaf-soil from a wood, two of good loam, not too stiff, one of granite chips, and one of shingle, is the recipe. Then there runs underground at the top of the slope a perforated lead pipe connected to a handy water-main from a pool to supply moisture in dry weather.

In this bed have been planted Rhododendrons of the Lapponicum series, with their tiny leaves and mauve-blue flowers, Rhododendrons of the extensive neriiflorum series (dwarf shrubs with brilliant scarlet and orange flowers), and others like *calostrotum*, *moupinense*, and *campylogynum*, which will not soon outgrow their fellows.

The climate at Bodnant is too severe to permit of *R. Aucklandii* or *R. Edgeworthii* and its sweet-scented hybrids being grown away from shelter; but we have found that if these shrubs are planted against a wall facing north or north-west they are usually a success. A dank shaded wall where one might hesitate to plant even the ubiquitous ivy is just the place for a tender Rhododendron; and I would suggest that even in the coldest districts Rhododendrons that prove too tender for the open should be planted on such walls, care of course being taken that fresh soil be put at the wall foot if the existing soil is contaminated with lime fallen from the wall or left by the builder. Of the scented section some lose their flower buds in a cold winter, *R. 'Countess of Haddington'* being a great offender in this respect; but *R. Edgeworthii* itself rarely loses a bud, and *R. 'Princess Alice,'* now covering a space of wall 12 feet by 12, has a great show of bloom each spring. Tender Chinese Rhododendrons such as *giganteum*, as well as those of the *eriogynum* type and of the Maddeni series, are also being tried in such places.

Much attention is given at Bodnant to the propagation and nursing of rare plants, and also of plants required in quantity; and I mention this specially, as possibly in some places too little attention is given to this most essential part of gardening.

In the first place there is the propagating frame—some 150 feet run of narrow frame, unheated, facing north, at the foot of the wall of the range of garden sheds ; this frame is surfaced with sand and filled every September with cuttings—

(1) of short-lived plants such as *Cistus*, Lavender, and the like, which it is everywhere necessary to replace from time to time ;

(2) of half-hardy shrubs of which it is desirable to have a reserve in case a hard winter destroys the older plants ;

(3) of *Pentstemon* and other border plants ;

(4) of rock plants ;

(5) of *Rhododendrons* of the small-leaved series and of the ever-green Japanese *Azaleas* ;

(6) of any new plant obtained from friends or nurserymen.

Most of these cuttings produce nice little plants in six to twelve months and provide a constant stream of material to replenish or extend. It is difficult to speak too strongly of the advantage of such a frame to the garden.

Secondly comes the raising of seedlings. From the kindness of one's friends, from expeditions in far lands, from one's own plants, come seeds that require attention—among them the produce of our attempts at hybridizing.

Most of the seeds, including those of *Rhododendrons*, are sown in moderate heat and the seedlings kept in this temperature for a year. These seeds are dealt with in an old vinery with careful shading ; other seedlings such as those of *Primula* and *Meconopsis* are better without heat, and these are dealt with in a cool house facing east.

Thirdly comes the preservation from frost and wet in winter of a stock of the more difficult plants. Go over a list some three or four years old of acquisitions, say, for the rock garden, and it is surprising to see how few have been permanently established and how many have been lost. Have a cold frame surfaced with ashes, well ventilated and kept dry in winter, and pot and plunge every new acquisition in this frame ; keep it there till you have propagated a good stock of young and healthy plants that you can try out in a variety of situations and soils, and you will find that most of your acquisitions become permanent residents of your garden. The labour spent on watering and on shading in the frame is trivial, and much time is saved when one wants to gather seed of, or take cuttings from, one's new and difficult plants. Hence at Bodnant a couple of frames are devoted to rock plants, a couple more to Chinese *Primulas* (of which a collection of species is grown), and one to *Meconopsis*.

The rock plants are kept in pots, but we find that both the *Meconopsis* and the larger *Primulas* do far better if planted out in their frames.

The greenhouses at Bodnant, other than those devoted to fruit, were for many years filled with decorative plants of average merit but of no very special interest in themselves. But the advent five years ago of a head gardener of very exceptional skill in the cultivation of indoor plants and of the widest knowledge of them started a new era

in the greenhouses. Most generous friends, giving not outcast plants but of their very best, have helped to form at Bodnant a small collection of *Cypripediums* and of *Cymbidiums*. These genera were chosen because the houses were fairly suitable for them, because they bloomed in winter, and because they are perhaps the best of Orchids for cutting and for travelling when cut. We have had, I think, no reason to regret our choice. Few Orchids are more decorative than the *Cymbidiums* and none more interesting than the *Cypripediums*.

A special place is given to the growing of the *Niveum* section of *Cypripediums*—an extremely difficult section to grow well, and therefore but rarely seen in good health; but many years ago the head gardener mastered the secret of their requirements, and under his personal care the sickliest and most rootless of acquisitions seem to take on a new lease of life.

For us the time of that greatest pleasure of Orchid-growing—the flowering of one's own hybrids—has not yet come, but many little seedlings are appearing, and room will have to be made for them by casting out all older plants that do not reach a high standard of merit. Room is limited indoors, and it is a mistake to grow plants not in the first rank.

Among other indoor plants, *Amaryllis*, originally of Ker's good strain, and the large flowered *Clivias* (again the gift of a generous friend) are grown and are being seeded.

A really fine *Amaryllis*, and a really fine *Clivia*, such as came to Vincent Square from Westonbirt, rank, I would suggest, among the first ten or twelve finest flowers the world produces; both are of the easiest growth. Pot the *Amaryllis* every second year in rich loamy soil and forget to water them for four months after the leaves die down—grow the *Clivia* in the vinery in the summer and in the greenhouse in the winter till the flowers are over, and both will reward you amply; but start with really good varieties, for there is much rubbish to be had.

Another of the world's great flowers, the *Phyllocactus*, grows well in a fruit house, and thrives at Bodnant in a box on the end walls of a heated lean-to peach house.

The Java *Rhododendron*, once everybody's plant, now hardly grown save at Kew and Westonbirt, is used to brighten a shady fernery. Special strains of blue and white *Streptocarpus* and of *Primula obconica*, selected and seeded each year, are also grown.

Of recent years the front of an unheated lean-to peach case has been used for bulbs of doubtful hardiness. The peaches are on the back wall, the path is close to them, and between the path and the steeply sloping glass was a vacant border some 3 feet wide in full sun; on this a raised brick bed has been built and filled with stones and soil so that the bulbs planted in it may be kept dry when the peaches are watered. Planted out in this bed, *Nerines* seem to do far better than in pots, and of these we grow a number of Mr. ELWES's well-known hybrids. Among the other bulbs grown here are *Vallotas*, the rarer *Crinums*, *Lachenalias*, *Zephyranthes*, the cooler growing *Pancratiums*,

Tritonias, *Tecophilaea cyanocrocus*, and a few of the tenderer lilies such as *sulphureum*, *nepalense* and *philippinense formosanum*.

As these increase a proportion will be planted out under a south wall in the open to test their hardiness.

It is a pleasure to Lord and Lady ABERCONWAY to allow all who care to do so to visit their gardens, and especially if those who come have a knowledge and a love of plants. While the gardens are open therefore to the public all the year round on Tuesday afternoons, they are open also on Friday afternoons in summer to members of the Royal Horticultural Society and friends accompanying them ; it is hoped that this may give the head gardener—Mr. F. C. PUDDLE—a better opportunity of showing visitors who are interested any plants or parts of the garden that they specially want to see.

Incidentally we find that this system furnishes each year a little batch of new recruits to the R.H.S., and I would therefore venture to commend it to the consideration of garden owners who scan with pride the growing membership of our Society.

SOME OF CANADA'S WILD FLOWERS.

By The Lady BYNG OF VIMY.

FOUR years ago when I came to Canada, I thought, like most English people, that, with a few exceptions, the country was as poor in flora as it was rich in fur-bearing fauna, but during the first few months of my sojourn I learnt my mistake. Not, I must say, that ignorance of Canadian flowers is confined to the English, for I have lively recollections of a Canadian, who, having assured me that she "adored gardening and flowers," said brightly, when I showed her one of her native "Lady's Slipper" orchids, "Ah, yes—those are what we call Iris, aren't they?"

Canada may be justly called "Our Lady of the Snows," but she is also crowned with a floral diadem which surpasses that of the Mother-country. The latter scores in the matter of snowdrops, primroses, daffodils, and wild hyacinths, but the Dominion has many plants that we treasure in gardens at home, and still more plants that we cannot grow at all. For this reason I should like—though I can lay no claim to expert botanical knowledge—to try and tell my home-staying countrymen, in the following simple notes, something about the wealth of flora and the wonderful beauties of a wide land which I have grown to love.

Having been specially asked to mention plants suitable for English gardens, I must say, regretfully, that they are comparatively few in number, and these should only be attempted by growers who can give them some semblance of their natural habitat. Canadian plants can stand intense cold, but they wilt under the raw damp that characterizes most English winters, and when the summer comes—a much cooler one than here—they struggle sadly for existence, a misery to themselves and a disappointment to their owners. There are, of course, a certain number from North America grown at home; but when one sees some of them in English gardens and then discovers them in Canada, the difference is hardly encouraging to our efforts for their acclimatization. For those who have the requirements, and the wish, to attempt growing Canadian plants at home, I would recommend HERBERT DURAND'S "Taming the Wildings," published by PUTNAM'S of New York, an admirably simple text-book, containing a good soil acidity map as a guide and charming illustrations showing the flowers in their native surroundings.

Having now travelled over forty-four thousand miles by train and boat, exclusive of many extra miles by motor, through the Dominion, I have seen—if sometimes from the train only, alas!—most of the plants on which I propose to dwell, and of which I will give both the botanical and local names, because the latter are generally descriptive. The Governor-General has to tour officially in places as far removed from

one another as Prince Edward Island and Vancouver; the Niagara Peninsula and Dawson City; and "official visits," meaning receptions by Mayors and Corporations, Lieutenant-Governors, or Provincial Legislatures, do not always square—either in garments or seasons—with a "plant hunt"! Still I have been amazingly lucky. Canadians, who are the kindest people in the world, and the most hospitable, realizing my craze, have, wherever possible, helped me to attain my dreams of grubbing in the wilds; and the moment the reception ends, the kindly and helpful Mr. ALLEN, manager of the Governor-General's train, and genial autocrat of our daily lives upon it, has, if possible, "parked" our perambulating home in good "hunting ground." Crowded stations left behind, waving Mayors and Mayoresses, school children singing "O Canada" and the National Anthem, being no longer in the offing, I fly into old clothes and by the time we are "parked" in our siding am ready for the fray. Armed with spades, forks, and other gardening impedimenta, off we go, my Secretary, a luckless A.D.C., and I, into the woods, or across the sun-scorched prairies, to seek for treasures that will eventually be housed in big wooden boxes filled with various kinds of soil that form "Her Excellency's garden" in one of the baggage wagons, and where they remain, either till they have died down enough to send home or till we reach Government House, where they are grown on. The windows of the observation car also play a useful part and, to the curiosity of station crowds, are hung with muslin bags of ripening seeds; so that I sometimes wonder if the people who see these bags think them part of the gubernatorial laundry!

There are in Canada at least six floral belts:

- (1) The Eastern—which includes the Maritime Provinces, mid and Southern Quebec, and Ontario.
- (2) The Prairies—Manitoba, Saskatchewan, and Alberta—east of the mountains.
- (3) Western Alberta and the foothills.
- (4) The Rocky and Selkirk Mountains.
- (5) British Columbia, including Vancouver Island.
- (6) The sub-Arctic region covering the North-West Territory and the Yukon up to, and just beyond, Dawson City.

These are rough borders and liable to overlapping, though I have known cases where there seems a clearcut line of demarcation, as for instance on the Prairies, near Medicine Hat, where I found large colonies of the Pin cushion Cactus (*Cereus Grahamei*) and a yellow-flowered Prickly Pear growing luxuriantly on the sun-parched land. Their habitat, however, was absolutely restricted, not a single plant appearing even a few yards above a certain northern line, so that it really seemed as if they had marked out their domain with a foot-rule!

The Eastern flora—which is the one I know best, because Government House is situated at Ottawa in Ontario—is chiefly confined to

the woods, streams, and lakesides that abound in this locality. The groundwork of the country is striated limestone of the Pre-Cambrian era, and in the lovely, almost eerily lonely woods, there is a wealth of soil undreamt of at home, because in Canadian forests the tidying hand of man has never obtruded itself; so there is an accumulation of leaf-mould which comes up on the fork when one digs in layers, like the "mille-feuilles" pastry of a French chef, and the residue formed by this and by tens of thousands of trees, felled by nature, rotted down by nature, from the end of the Glacial period to the present day, produces some of the richest soil in the world. The second outstanding asset horticulturally, and one we cannot supply at home, is the "poor man's fertilizer," as the snow is called, which, for at least four to four and a half months of the year, acts as a blanket against the rigours of a temperature ranging from freezing to 40 below zero. The snow is at once a fertilizer and protector, a fact which I think is proved by the following instances. I found *Calopogon pulchellus* growing in a Nova Scotian swamp, where I waded knee deep in peaty water, floundering from tussock to tussock of Sphagnum moss, as I grubbed up Pitcher Plants (*Sarracenia purpurea*) and Calopogons. Curious to learn about them, I turned to Cassell's Dictionary of Gardening, and found this comment: "Calopogons may be grown in pots, in peat and loam, with sand, and though nearly hardy do best with greenhouse treatment." Snake-mouth (*Pogonia ophioglossoides*), Cassell's also said, "needs a mean temperature of 50," yet I found the Pogonias in the Gatineau Hills, covering a fallen tree that jutted out into a lake, the decaying tree trunk so matted with the threadlike orchid roots and tough fibres of bog myrtle that the only means of lifting the former was to cut chunks of the rotted tree out with a jack-knife! I thought how both orchids would have chuckled could they have read the English description of themselves! Of course the answer to it is the snow; though, even so, it remains a conundrum to me how the more fleshy and shallow rooted plants survive in a climate where, despite snow, the frost goes three or four feet into the ground. However, grow they do with astounding prodigality, and though they mostly lack fragrance they outshine our English flowers in colour and size.

Horticulturally—in the East and on the Prairies—Canada is dead, usually, till the latter part of April or early May. Then the flowers come with a rush. In a week or two the summer is upon one, with an almost tropical sun, myriads of hungry mosquitos and equally voracious black flies, drawbacks one forgets in watching the wonders and rapidity of plant growth. Before the snow has cleared from the ditches, and while there is still a bite in the West wind, open woodlands are carpeted with blue, mauve, pink and white Hepaticas; the thin tasteless sap of the Maples trickles into "sugaring cans" hung from *Acer saccharinum*; and the earliest of the lovely Blue Birds flit by like living sapphires, while American robins sing lustily, and frogs, with a sound like distant sleigh bells, croak their lovesong in every pool and stream. At the same time as the Hepaticas appears the fragrant

loveliness of Trailing Arbutus (*Epigaea repens*), so great a temptation to the flower-seller that it has been ruthlessly torn up for sale and is practically extinct in any spot within reach of a town, though it flourishes in the remote woods of Quebec and the Maritime Provinces. Next comes the Bloodroot (*Sanguinaria canadensis*), with its pure white, golden-anthered flowers and grey-green leaves hugging the limestone rocks. The first time I saw it I was moved to pitying amusement at the contrast between what we succeed in producing at home and the reality! At home I have never found more than a small bloom or two on a plant and meagre foliage. Here the blooms are plentiful and the leaves about the size of a big fig leaf. In fairly open, as well as thick, woodlands, Trilliums—*grandiflorum*, *cernuum*, *undulatum*—dance in the breeze like flights of white butterflies, and *erectum*, handsome but rank-smelling, displays its claret-coloured blooms for the delight of the carrion-fly. Around Ottawa itself, in the thin woodlands, *Erythronium americanum* takes the place of grass, and *E. propullans* also grows in the province. With the Erythroniums come Bellworts (*Uvularia perfoliata*) of lemon-headed fragility; the gold and crimson *Aquilegia canadensis* nods from crevices in the rocks, where it seems impossible it can find sufficient soil for its maintenance; while Dutchman's Breeches (*Dicentra cucullaria*) and Squirrel Corn (*Dicentra canadensis*) fill every crevice with their floral loveliness and feathery beauty. In May the moist meadows of Quebec and Ontario are gay with Mitrewort (*Tiarella cordifolia*), Violets of all hues, Forget-me-nots near the streams, *Caltha palustris*, though the blooms of the latter are never as fine as ours at home, and in the sheltered corners Quaker Ladies (*Houstonia coerulea*) grow in big tufts, followed later by Sabatias. A few miles only from the heart of Ottawa one plunges into the amazing woods of the Gatineau Hills, a spur of the Laurentian Mountains—dotted with chains of lakes, large and small, linked by narrow streams. In the midst of these wilds one comes suddenly on small farms, carved out of the wilderness—lonely, remote, their inhabitants leading a solitary existence, especially in winter when they are isolated by snow. In these woods—damp, fragrant, mysteriously silent, devoid of almost all bird life—and around the hidden lakes you find most of the wonders of the Eastern floral belt. There are jungles of mosses and ferns: Aspidiums, Aspleniums, Phegopteris, Osmundas, to name but a few at random, and, loveliest of all, *Adiantum pedatum*, with fronds 3 feet in height, that turn an amazing silvery green in autumn. Besides ferns and mosses, there are endless low-growing plants, such as Spring Beauty (*Claytonia virginica*), with its brittle white roots that never seem to end, and an impossible thing to transplant, because it rises from a deeply seated tuber that invariably snaps off when one tries to dig it. Goldthread (*Coptis trifolia*) covers acres of the densest woodlands with its shiny foliage and dainty white blooms. Creeping Snowberry (*Chiogenes hispidula*) with attractive white berries; Partridge-berry (*Mitchella repens*), pink-bloomed and red-berried; *Dalibarda repens* that pro-

duces strawberry-like blooms; the Mountain Cranberry (*Vaccinium Vitis-Idaea*) growing from 3 to 7 inches in height; Large Cranberry (*V. macrocarpon*); Small Cranberry (*V. Oxycoccus*), with long slender trails and little rose and white blooms that look like miniature martagon lilies. Perhaps fairest of all the creeping plants is the dainty Twinflower (*Linnaea borealis*), of which there is a true tale that says when Linnæus received it for nomenclature, and learnt of its shrinking habit, he said it was so humble in its ways and appearance that he begged it might bear his name. He showed wisdom in his selection of a floral godchild, for although the Twinflower may be "meek and lowly of heart," it is amazingly persistent and spreads its delightful creeping foliage and slender pink and white bells over practically all the woodlands in the length and breadth of Canada. Gaultherias abound—*procumbens*, called Checkerberry or Wintergreen, in the East, while *G. ovalifolia*, and Salal, as the Indians call *G. Shallon*, thrive in the West, where the latter is, I believe, a necessary companion for the growth of Indian Paintbrush (*Castilleja miniata*). Amongst other woodland plants of modest proportions are the Canadian Mayflower (*Maianthemum canadense*), whose fluffy white spikes are succeeded by berries, ranging from red to quaintly speckled bronze; the Starflower (*Trientalis americana*), gracefully slender; Twin-leaf (*Jeffersonia diphylla*); Bunchberry (*Cornus canadensis*); Wild Ginger (*Asarum canadense*), more curious than beautiful, with its purple-brown, sac-like flowers lying right on the ground. Then come the Violets, in a riot of purple, pale blue, indigo, and white, ranging from the minute and slightly fragrant *Viola blanda*, through *palmata*, *sagittata*, *palustris*, *lanceolata*, *rotundifolia*, *canadensis*, *striata*, *conspersa*, with here and there *pedata*, and finally the golden-flowered, branching-stemmed *pubescens*. The Violet season lasts from April to early July, and the prodigality of bloom is unbelievable. Following the Violets are Anemones; *A. patens* var. *Wolfgangiana* growing westwards and called, for some unknown reason, a "crocus"; Chalicecup (*A. occidentalis*), *Drummondii*, *multifida*, and *parviflora*, whilst in the East are *virginiana*, *riparia*, *canadensis*, *cylindrica* and *quinquefolia*, in the open woods or along roadsides. In thick woods, where there is ample moisture, grows Jack-in-the-Pulpit (*Arisaema triphyllum*), which puts our Lords-and-Ladies to shame with its handsome purple brown and green striped blooms reaching 2 to 2½ feet high, and succeeded by cone-shaped heads of vivid scarlet berries. Belonging to the same family are the little Water Arum (*Calla palustris*), which thrives in cold northern bogs and swamps during June, and, westwards, the handsome but, some think, malodorous Skunk Cabbage (*Symplocarpus foetidus*), of which there is a forlorn group at Kew tucked away near the door of a greenhouse, when, poor thing, it is pining for swampy ground, where its great leaves and attractively streaked flowers would develop to their full and the red of its seeds gladden the autumn days.

Indian Cucumber (*Medeola virginica*), though not showy, has the

rare charm of possessing a blue berry. The same applies to the Blue Cohosh (*Caulophyllum thalictroides*) and the lily-of-the-valley-leaved *Clintonia borealis*; while in the West there is a beautiful blue-berried Elder, fairly dwarf in habit, with deeply serrated leaves. The White Baneberry (*Actaea alba*) has ovate china-white berries, with a black spot at the apex, which has gained for them the title of "Doll's Eyes." A common and attractive plant, that is pernickety in its likes and dislikes, is the May Apple (*Podophyllum peltatum*), which you find covering miles of open woodland, but, as suddenly as you find it, it will cease to be and decline to grow at all.

Fast on the heels of the earlier flowers come the Orchids, of which the following sixty species grow in Canada—*Aplectrum* (1), *Arethusa* (1), *Calypso* (1), *Calopogon* (2), *Corallorrhiza* (4), *Liparis* (1), *Triphora* (1), *Pogonia* (2), *Orchis* (2), *Malaxis* (2), *Listera* (5), *Epipactis* (5), *Spiranthes* (5), *Cypripedium* (6), *Habenaria* (22). Orchid-hunting is as exciting as big-game hunting, for orchids are as elusive as game. You may wander for days through tangles of undergrowth to likely looking swamps and lakes; you may wade through ankle- or knee-deep mud and "muskeg," to places where, by all the rules of the game, orchids should abound, but not a sign of them will you see. Then suddenly, within no more than a few feet of your last failure, you will, after struggling through a jungle of *Thuja occidentalis* and Hemlock spruce, identical with what you have just left, reach a lake, equally identical with the one a few paces away, and you will catch your breath with joy at the wealth of *Cypripedium acaule*, *spectabile* or *parviflorum*, that surround the water, while tucked away under sheltering branches of the evergreens will be unbelievably tall spikes of *Habenaria fimbriata* and *H. Pycnodes*. There they are, all the beauties you have hunted, till despair nearly seized you, and you stare spellbound at them, while a flight of scared duck rises shrieking from the lake, the loons dive under, to reappear half a mile away, uttering the eerie cry that resembles a maniac's laugh, and infuriated squirrels storm at you from the trees for daring to enter their demesne.

In places where the orchids grow they do so in profusion, and there are few more beautiful sights than these lovely flowers, with their tall stems and crinkled leaves rising from a groundwork of Sphagnum moss and backed by the rich depth of evergreens that fringe the Canadian watersides. The uncertainty of the orchid habitat is due no doubt to the fact that the seeds only germinate where they find the presence of fungi inducing mycorrhiza in orchid roots. Anyhow the abundance of a certain species in isolated areas and its complete absence a few yards away might well be explained along this interesting scientific line. The truth of the deduction is accentuated by the experience of Mr. H. T. Güssow, of the Experimental Farm, who says, "My endeavours—not altogether successful so far—to grow certain wild Canadian orchid species from seed seem to emphasize the necessity of the presence of specific mycorrhizal fungi in order to obtain that degree of stimulation commonly referred to as symbiosis."

The question is interesting from the scientific aspect and also from that of the orchid hunter, on whose weary soul despair frequently begins to descend after long and fruitless days. In cold Northern bogs and wet woods, the rarer Ram's Head Lady's Slipper (*Cypripedium arietinum*) is found, and in the West *Calypso bulbosa* thrives; also *Orchis rotundifolia*, in places where it can combine very wet ground with full sun; while the lovely White Mocassin Flower (*Cypripedium passerinum*) is sometimes found. To my immense delight I found, at Fairmount Hotsprings in the Columbia Valley, B.C., a big colony of Stream Orchis, or Chatterbox (*Serapias gigantea*), long-stemmed four-foot plants, hung with little blooms, which from their tremulous movements reminded me of old women in sunbonnets, with hooked noses and chattering jaws busy retailing their neighbours' affairs—an appearance which has probably gained for them the nickname of "Chatterbox." Some botanists claim this Orchis as being identical with one growing in the Himalayas.

Simultaneously almost with orchids come the Pyrolas, including the following varieties: *secunda*, *chlorantha*, *elliptica*, *americana*, *asarifolia*, and loveliest, as rarest of them all, One-flowered Pyrola (*Moneses uniflora*), a little beauty that, like its brethren, is I think one of the most exasperating plants to lift, for the roots are brittle past belief, running in every direction that they should not run in, and when you have dug up a square yard or two of woodland you find you have failed after all to get the tricky plant, while its seeds have a perverse habit of either not having ripened, or of having wholly disappeared from its pods before you find them. Pipsissewa (*Chimaphila umbellata*) and Spotted Wintergreen (*C. maculata*) are beautiful also, while the Shooting Star—or American Cowslip, as *Dodecatheon Meadia* is called here—is well known in English gardens, though I do not think personally it is as attractive as the Pyrolas with their lily-of-the-valley-like blooms, ranging from pale green through white to a rose pink.

In the densest spruce woods are the two Saprophytes—Indian Pipe (*Monotropa uniflora*) and Beechdrops (*M. Hypopitys*). The former is attractive as well as curious, though one has a feeling that it is uncanny, with its ghostly half-transparent whiteness of flower and stem, the whole plant not more than four or five inches in height, and forming a compact little group under trees through whose thick boughs only the dimmest sunlight penetrates. In shape the bloom is like an inverted pipe-bowl, hanging downwards till the seed capsule has formed, when it raises itself to an erect position and scatters its contents over the pine needles and decaying wood, on which alone it thrives. Beechdrops are a pale tan colour, and smaller than Indian Pipe but with the same habit. *Monotropa Hypopitys* is found sometimes in Britain but not *uniflora*.

Gentians—*crinita*, *quinquefolia*, *Andrewsii* and *procera*—thrive in Quebec and Ontario, so do the Lilies, *canadense* and *philadelphicum*, along railway embankments, where they nod in the long grass before it is cut for hay, and where, with it, they share the same fate. Wild

roses of infinite variety and beauty, all of them far richer in colour than ours at home, abound, and in the Maritimes I found a scentless double variety that may be an escape from gardens originally and whose name I never traced. Another wilding in the Maritimes is *Hemerocallis fulva*, thriving in waste places among rank grass, and in the boggy land is the double meadowsweet, while pitcher plants (*Sarracenia purpurea*) abound in the swamps, and I have heard of, but not seen, Scotch heather in those essentially Scotch provinces.

The Eastern woods bring their season to a close once the foliage darkens them, and then the prairies burst into beauty, with Pentstemons in great variety, while the sun-baked soil is carpeted in many places by Cheeses (*Malva rotundifolia*). Near Nelson, B.C., I found a most attractive tall bush of a mallow whose name I failed to ascertain, but which, from its rose-pink flowers, like a miniature hollyhock, may have been *Sidalcea neo-mexicana*. Clinging to the fringe of the rich wheat fields are innumerable gaudy flowers, such as Black-eyed Susan (*Rudbeckia hirta*), Coneflower (*R. laciniata*), *R. triloba*, which has no local name, and *Gaillardia aristata*, Black Samson (*Brauneria purpurea*), several species of Coreopsis, masses of blue Linum, and a range of Helianthus ranging from *giganteus* through half a dozen other varieties. The vivid splendour of the aptly named Tall Blazing Star (*Liatris punctata*), and the rich purple of a big Mint, whose name I failed to get, are others among the wealth of colour fringing the harvest fields before the reapers lay them low. Out on the sun-baked and driest prairies are vivid-hued "desert" flowers, such as the two Cacti already named; the frail beauty of Mariposa Tulip (*Calochortus Nuttallii*), *Gilia aggregata*, *Asclepias ovalifolia*, *A. incarnata*, and *A. syriaca*, Poke Milkweed (*A. phytolaccoides*), a host of Zygadenes, *Petalostemum candidum* and *purpureum*, *Psoralea argophylla*, and the attractive *Geum triflorum*, whose feathery seed heads wave in the winds that sweep hotly across the flat land. Gay-coloured vetches and sweet clovers scent the air, blowing into the train as one passes, and forming a delicious contrast to the smoky dust, thick and penetrating, that steals through every crevice, from the soft coal burnt on the engines. Lupines give a wonderful stretch of colour, while up in the mountains at places like Jasper Park the Astragalus and Oxytropes are a sight to remember, with their glowing purples and blues rising from tufts of hairy, silvery leaves. Everywhere on the driest of railway banks are Pearly Everlasting (*Anaphalis margaritacea*), Pussytoes (*Antennaria plantaginifolia*), and the dwarf Fly Honey-suckle (*Lonicera canadensis*), rusty-leaved, golden flowered, while accompanying it is the Spreading Dogbane (*Apocynum androsaemifolium*) with dainty pink and white bell flowers, followed by polished bronze pods, sickle-shaped and filled with silky seeds that scatter in all directions. Early White Saxifrage (*S. virginiensis*) is another rank grower on dry ground, while I have seen, in the mountains of the Columbia Valley, B.C., which seems to me an ideal plant-hunting ground, *S. oppositifolia* growing abundantly.

In the West the growth is as luxuriant as in a tropical country, and the British Columbian underbush is almost impenetrable. On the edges of this jungle are all manner of interesting plants: *Heuchera micrantha*, clinging to the rocks, and in damp ground the handsome Indian Hellebore (*Veratrum viride*) with its big crinkled leaves and long tassels of bloom swaying in the wind; Devil's Club (*Fatsia horrida*) with vicious-looking thorns, clusters of red berries and spreading spiky leaves; *Lonicera involucrata*, bearing curious black fruits and red husks; ferns innumerable, also berry plants, such as *Rubus odoratus*, Salmonberry (*R. spectabilis*), Thimbleberry (*R. parviflorus*), and the delightful little Creeping Raspberry (*R. pedatus*). In dried river beds of the West, and in the hills round Dawson City, I have seen acres of *Dryas octopetala* and *D. Drummondii*, though the former is more plentiful, and as the summer draws to a close its shaggy seed heads adorn these stony places by the thousand.

In the mountains there are endless plants and shrubs, such as Mountain Rhododendron (*Azaleastrum albiflorum*); *Rhododendron canadense*; Rose Bay (*R. maximum*); Lapland Rose Bay (*R. lapponicum*); to touch only the fringe of those many shrubs for which there is no space in the present notes. There are Alpines too, and, I believe, a wide range of unclassified plants that would well repay an enthusiast who could spend the time in seeking them out, not only in the Western mountains but also along the Gaspé Peninsula in Quebec Province, where whispers came to me last year of a complete and practically unknown flora. Among the recorded Alpines in the Rocky Mountains are *Phlox subulata*, Achilleas, Androsaces, Antennarias, Arenarias, Drabas—to name but a few; and I have seen wonderful effects, above the timber line in moist folds of the mountains round Jasper Park, of carpets of Forget-me-nots of an amazing hue, Golden Arnica, Dwarf Harebells, and great drifts of the Northern Heliotrope (*Valeriana septentrionalis*) whose fragrance scented the air, while in rather drier spots the yellow of *Aquilegia flavescens* was also a wonderful sight, and *A. formosa*, which, though of the same colouring as *A. canadensis*, has more squat-shaped flowers and needs a moister situation than its fellows. Of the Western flowers and shrubs, many would thrive at home because the climate is more of the same damp quality, though British Columbia and Vancouver Island are on the whole warmer than England.

Finally, in the Yukon, thanks to twenty-four hours' daylight in the summer months and an intense sun, there is a wealth of berry-bearing plants—wild gooseberries, currants, raspberries, blueberries, and high bush cranberries abounding, so that the North-Western housewife takes a big pail to the hillside and gathers what she wants for her jam-making and preserves without the trouble of cultivation. She frequently finds herself with the black bear as a rival, for, at the berry harvest season, he is beginning to stoke up for the winter hibernation, and above all things he likes sweet, ripe berries. But the black bear is a harmless, quite friendly neighbour, and he has been known to pick

on one side of a bush without harming the housewife picking on the other! Plenty of berries exist for both in the sub-Arctic! There is also quite a good perennial flora, such as Lupines, Pentstemons, Dryas, Campanulas, etc., though the season is so short that frequently frost and snow catch them before the flowers have time to bloom, so that, entering a premature winter in this state, they hibernate, with flowers and leafbuds in so advanced a stage that, when next year's sun reaches them, they seem to break into blossom overnight and present an amazingly rapid development of vegetative and floral organs.

In the extreme south-east of Canada, the Niagara Peninsula, and due south, in the Okanagan and Kootenay Valleys, peaches grow on bush trees, not against walls as at home; plum trees, apples, etc., are immensely prolific, and in the Niagara Peninsula grapes, in the open, are trained to wire fences, ripening as they do in Southern France and Italy, and making a palatable wine, though when eaten the grapes have a musky flavour that is rather peculiar to an English taste.

Of plants that literally stretch for miles all over the Dominion are *Iris versicolor* and *I. prismatica*, which fringe every stream and pool with their blue and purple loveliness; Lambkill (*Kalmia angustifolia*) which clothes the bogs with roseate beauty, Labrador Tea (*Ledum groenlandicum*), from whose rusty and leathery green leaves in early days the Hudson Bay factors were frequently reduced to making a semblance of tea when the legitimate supply failed; *Vacciniums* of many kinds, casting, when in fruit, a purple tint over the burnt-out peat bogs, especially in the Maritimes, *Spiraea latifolia*, and *Aruncus*, with *Cimicifuga racemosa*, Wild Rosemary, masses of our own familiar Bog Myrtle and tall spikes of Asphodel form a fairly comprehensive list of swamp-loving plants. Wherever the terrible forest fires have ravaged and swept the land, up comes at once the Fireweed (*Epilobium angustifolium*) in such masses that when travelling through burnt-out miles of hill and dale it is hard to believe that it is the *Epilobium* which paints the landscape pink, and not Scotch Heather in full bloom.

Last of all, as the summer, alas! draws to a close, comes a veritable riot of Asters (57 named species), Solidagos (22 named species), ranging from the Alpine *Culleri* to the tall *canadensis* and *serotina* that we treasure in gardens at home, while here they ramp over every available piece of ground, thrusting themselves up in cultivated fields, by waysides and in swamps where, in company with Joe Pie Weed (*Eupatorium purpureum*), Turtlehead (*Chelone glabra*), Ironweed (*Vernonia noveboracensis*) and the ubiquitous little orange and gold Touch-me-not (*Impatiens pallida* and *I. biflora*), they form natural herbaceous borders of an inconceivable beauty and richness. In sheltered, swampy corners grow the flaming *Lobelia cardinalis* and *Lobelias Kalmii* and *spicata*, tiny, single-flowered, sky-blue beauties, swaying on hair-like stems. Up the trees in September, the Bittersweet (*Celastrus scandens*), unnoticed till now, wreathes its tough stems round the branches, festooning them with sprays of

globular orange berries, emerging from scarlet envelopes—glories of colour that remain long after the final leaves have fallen to their earthly beds and the last American robin has flitted southwards. Virginia Creeper flings its slender, red-leafed tendrils everywhere; wild grape vines hang golden leaves and bunches of small fruit from the bushes they have almost choked as autumn comes upon the world. But no words can describe the glory of those October days under a sky, translucently blue, flecked with white clouds above masses of dark Hemlocks, Weymouth pines, Scotch firs, and snowy-stemmed birches dripping their golden leaves on the ground; maples clothe the Gatineau Hills in every tint of crimson, scarlet, ruby, russet, gold, amber, and bronze that the mind of man can conceive, but which very few artists have the courage to try to portray. In those days Nature, colour-mad, cries her wares to the world: "Look! Rejoice at my wonders! Enjoy my gifts for the last time before snow veils my glories, or the bitter winds and frosts of winter strip me of my flaming robes." And one does look, rejoice, revel in it all, with speechless awe, to see a scene almost too beautiful to be real, and too gorgeous to be the first touch of decay and the death-bed of another year.

PTEROCARYAS AND ZELKOVAS AT ALDENHAM.

By the Hon. VICARY GIBBS, V.M.H.

PTEROCARYAS.

THE Pterocaryas, or winged hickories, form a hardy, deciduous genus with stout boughs and large pinnate leaves. They belong to the order Juglandaceae, as do also the walnuts and true hickories; like the former, but not the latter, the pith of the twigs is chambered; unlike either, the small nuts have membranous wings. So far only eight species have been discovered, and of these, two, *P. Delavayi*, said to be very like *P. Paliurus*, and *P. macroptera*, both Chinese forms from the mountains of Yunnan and Kansu respectively, have not been brought into cultivation, whilst the third, *P. insignis*, of which a full account can be found in "Plantae Wilsonianae," is a new species discovered by WILSON in Western Szechuan, described by him as being very rare and closely related to *P. rhoifolia*, and is probably not in cultivation, though seed was sent to the Arnold Arboretum, where perchance it may be.

The five known to European gardens are all represented in the Aldenham collection, as also is the hybrid *P. × Rehderiana*, and all have thriven except *P. hupehensis*, and as I have never had more than one specimen of this it would be unsafe to draw any general conclusions from the fact that a single specimen has done poorly. The drawback from which all members of this genus suffer, when brought from their native home to England, is that they do not as a rule get enough sun heat in late summer and autumn to ripen their wood thoroughly, and consequently are liable to suffer from spring frosts when the dormant period is over, even though they may be capable of withstanding a much lower temperature than they are likely to encounter in our winters. Most, if not all, of the genus are alleged to prefer a moist boggy soil, such as is beloved by alders, but nothing of the kind exists at Aldenham, where the sub-soil is solid London clay, and where the rainfall is low, rarely exceeding 24 inches in the year; yet I have had some twenty or more plants of the various species long enough to prove that these conditions do not prevent their development into handsome specimens. All Pterocaryas when in fruit can be easily distinguished from their relations the walnuts; but as fruit can so seldom be seen in England that is not really very helpful, and their genus can be determined more easily by the fact that the buds are either scaleless or are set in a long beaked funnel formed of membranous scales, whereas the walnut has a short bud with two or three scales.

P. caucasica is the only one that has been grown here long enough to reach complete maturity and show the magnificent proportions and picturesque appearance which it is capable of attaining. My own experience of the genus is neither very long nor very wide,

but, such as it is, it makes me confidently anticipate that both *P. × Rehderiana* and *P. rhoifolia* will, when sufficient years have passed for their full development, emulate it. *P. caucasica* comes, as its name imports, from the Caucasus, and is also found growing wild in Persia, usually in marshy ground for which nature has admirably adapted it; along the coast of the Black Sea it can be seen in company with our common alder (*Alnus glutinosa*), and other broad-leaved trees, but in this locality, owing to its disposition to break up the main stem into branches very little above the ground level, it more often takes the form of a big bush than of a tree. This species grows very rapidly in its young state, especially where it is protected by its situation from spring frosts; the oldest plant at Aldenham, standing out in the open, which was raised at Fota and given me by the late Lord BARRYMORE, well over thirty years ago, has been crippled again and again by these, so much so that I fear it has been permanently stunted, and it has long been beaten in the race by two younger ones, which were given me by a dear old friend, Lord DUCIE, who also joined the majority in 1921, and whom I sorely miss. Its rapid growth under favourable conditions is well illustrated by the fact that a man was living only a year or two ago who could remember, when a small boy, watching his father, then gardener at Claremont, plant the famous specimen there. This, in 1903, had the, for its age, colossal girth of 18 feet, and in the thirteen years that passed before Mr. BEAN had come to describe it in his book had added another foot! The bole, it is true, is only 4 feet high before it breaks into branches, but the spread of these is really enormous, and anyone who saw it any time during the present century would find it very difficult to believe that a living man had seen it planted. The tallest tree of the kind which Mr. ELWES could discover (and he and Dr. HENRY visited between them nearly every place of importance in Great Britain and Ireland) is at Melbury, Dorset, on Lord ILCHESTER's estate. It had a height in 1907 of 90 feet, and a clean bole 15 feet long, the girth of which, however, is some 6 or 7 feet less than that of the Claremont giant. The introduction of this species from Persia to France by MICHAUX dates back as far as 1782, and it was presumably not very long thereafter that it reached our country. The first time it is known to have fruited in Europe was at Malesherbes in 1826.

BEAN records magnificent examples in the outskirts of Vienna, where the summers are much hotter and the winters much colder than is commonly the case with us. The large pinnate leaves sometimes reach 2 feet in length, and have stalkless leaflets varying in number from $3\frac{1}{2}$ to $13\frac{1}{2}$ pairs. The long female catkins are from 12 to 20 inches, and the much shorter male ones from 3 to 5 inches in length: on the former are produced the small, roundish, winged nuts which are not usually borne until the tree is over thirty years of age; the buds, unlike those of the walnut, are naked. ELWES mentions a remarkable property of the foliage that if crushed and thrown into the river, or pond, it has the effect of intoxicating the fish, which come up to the

surface and are easily caught. This fact, if fact it be, for I cannot pretend to have personally tested it, somewhat reconciles us to the little use which has been made of this fine tree in water-logged lands, and those subject to floods, for which it would appear to be specially fitted, and for which, beyond poplars, willows, and alders, the choice is small; for if *P. caucasica* were more popular and its properties better known the difficulty of preserving salmon rivers or trout streams from poachers would be greatly increased. The two best specimens at Aldenham, which were both planted at the same time, about seventeen years ago, are exactly the same size in all respects, being 30 feet high, and having a girth at 4 feet above ground of 17 inches, and a spread of branches 8 feet across. The best plant at Kew arrived in 1875, and now has a height of 32 feet. It is in effect a big bush with no trunk. Another plant there is 28 feet high and has a short trunk which at 1 foot from ground girths 2 feet 1 inch.

There is also a variety of this of dwarf habit and with small leaflets, *P. c. dumosa*, which I do not possess, and do not know to be in cultivation anywhere in England except at Kew, where there is a healthy spreading bush near the Pagoda, 7 feet 6 inches high. It was first observed at Segrez in M. LAVALLÉE'S interesting collection, but has also been seen growing wild in the Caucasus intermixed with the ordinary type.

P. hupehensis, from the Hupeh mountains and W. Szechuan, in China, was first discovered by Dr. HENRY in 1888, and was collected later by E. H. WILSON, the well-known explorer, for Messrs. VEITCH in 1901. His account of it in "Plantae Wilsonianae" is as follows: "This is a common tree in moist woods and by the side of streams in Western Hupeh between 1,200 and 2,000 m. altitude. The bark is fibrous, smooth, and pale grey, becoming deeply fissured on the trunk of old trees." It is said to reach 70 feet or more in its own habitat. The pinnate leaves are decidedly shorter than those of *P. caucasica*, to which it is very near akin; they average about 9 or 10 inches in length, and the leaflets are from seven to thirteen in number. It is believed to be quite hardy, but it has not been long enough in the country, or at any rate I have not seen enough specimens to express confidence as to its future here. My own plant was bought from VEITCH'S Nursery at Combe Wood in October 1913; it has done so poorly as to give very little idea of what it might look like if more flourishing. The central lead has died down, and it has sent up a lot of growths about 3 feet high from the ground; had I any better specimen it would not be worth preserving. At Kew, however, they have a specimen 22 feet 6 inches high, girthing 2 feet 1 inch at 1 foot above ground, but they have no record of when, or from whom, it was received.

P. paliurus, like the last, was first found by HENRY in 1888 and sent home by WILSON in 1901. It is said to be fairly common in the moist woods of W. Hupeh, and WILSON uses almost identical words to describe the bark with those applied by him to *P. hupehensis*.

In size and number of leaflets the foliage of both seems much the same, so far as a written description goes, but the effect of *P. Paliurus* is to my mind handsomer, and its appearance according to all who have seen it when bearing its large-winged fruit is remarkably impressive. This, however, I have never witnessed, nor indeed I imagine can anyone else at present, unless he is prepared to visit the mountains of Central China for that purpose. Mr. ELWES remarks that as it comes from a higher altitude than *P. stenoptera* it should prove hardier, and this may be true so far as winter cold is concerned, but, so far as my small experience goes, based on acquaintance with one small plant, its growth has been much hindered, and sometimes even its life imperilled, by spring frosts. It does not appear to make a big tree even in its own country, where its height never much exceeds 50 feet. This is the only one of the genus which has wings going all round the nuts. My plant is 6 feet high, and quite healthy. It has been at Aldenham probably about ten or twelve years and, were it not for past injuries by frost, when the sap was up, would by now I should guess be quite twice its present size; if I could only succeed in getting it up above the frost level I should expect it to flourish well. Mr. BEAN's report on the plant is that it is extremely rare and not represented at Kew.

P. × Rehderiana is an accidental hybrid (*P. caucasica* × *P. stenoptera*), which occurred at Segrez in M. LAVALLÉE's arboretum through wind carrying the pollen of the former to the latter. The seed was sent to the Arnold Arboretum as that of *P. stenoptera*, but when it grew was found to be a hybrid. Its complete hardiness is proved by the fact that it flourishes there unchecked by the fearfully severe winters that rage in the vicinity of Boston, and ten years ago it had already reached a height of 40 feet. It may be worth while in this connexion to remind readers that trees in the Eastern United States grow usually with twice the rapidity that they do here; against this advantage must, however, be set the terrible number of insect pests injurious or fatal to tree life, from which our country is happily almost free. Mr. BEAN describes this *Pterocarya* as intermediate between its parents; like most of the first generation of hybrids it is a vigorous doer. This plant, like many other of my treasures, was given me, when two or three years old, by Prof. SARGENT, in December 1913. It is now a shapely, clean-stemmed pyramid, with leaflets rather smaller than those of its paternal parent, 24 feet high with a girth at 4 feet of 18 inches, and a spread of boughs 14 feet across, being as promising for its age, say thirteen years, as any tree in the whole collection (fig. 74). The Kew specimen is 32 feet high with a girth at 1 foot above ground of 2 feet 6 inches. It came, as mine did, from the Arnold Arboretum, but at a much earlier date, viz. in 1888.

P. rhoifolia is the only one of the genus which claims Japan as its habitat, and there makes a big tree 80 to 100 feet high. It was brought to England by the Duke of BEDFORD in 1888 or 1889. The leaves are 8 to 12 inches long, and the leaflets eleven to twenty-one in number. BEAN states that "it is quite hardy and in a moist loam would

apparently grow well"; my experience, such as it is, confirms this, for the Aldenham plant has never looked back since it came, about twenty years ago, and has not even suffered from our chief enemy, spring frosts. It is now 27 feet tall, and has a girth at 4 feet of 21 inches, and a spread of branches 14 feet across. It forms a shapely pyramid with a clean stem of 6 feet before the boughs begin (fig. 75). None of this genus have the untidy and disfiguring habit, so common with elms, of throwing out epicormic twigs, which can never develop into true boughs. The best Kew plant was 12 feet high in 1907; now there is one there, which was acquired in 1899, 22 feet high with a girth of 18 inches at 1 foot from the ground; another plant which reached Kew eleven years earlier is smaller both in height and girth. It will be observed that this species has done better in the heavy clay of Aldenham than in the light soil of Kew.

P. stenoptera comes from China, and was introduced into Europe about 1860, though no trees approaching sixty-five years of age are recorded in the books, or known to me. The oldest which I have myself seen is the one at Tortworth, Glos, which is now over 35 feet high, and had a girth in 1905 of 2 feet 3 inches. Its naturally rapid growth is often interfered with in England by spring frosts, which, owing to insufficient autumn heat, punish the young unripened shoots. The explorer WILSON, who frequently found this species on his travels in Kiangsi and W. Hupeh, gives the following good account of it in "Plantae Wilsonianae": "This is one of the commonest trees on river banks and on the stony and sandy beds of summer torrents in Hupeh and Szechuan up to 1,000 m. altitude. . . . It is a quick growing tree, attaining the height of 20 to 25 m. and a girth of 4 to 6 m. with massive spreading branches, and thick, deeply fissured grey bark. . . . The wood is soft, brittle, and of no value except for fuel." Probably this last sentence could justly be applied to the whole genus. It is used as a street tree in Shanghai and other Chinese cities, and is called by English residents "Chinese Ash," for it so far resembles an ash in that it has grey bark and pinnate leaves. The fruit, which I have never seen myself, is stated to carry long, upright, lanceolate, glabrous wings. This, and indeed all the species except *P. caucasica*, are quite rare in cultivation, and places besides Aldenham, where all can be seen, are few and far between. My plant, which I secured about a year before I did *P. Rehderiana*, viz. September 1913, when it was kindly given by the Director of Wisley, has not done nearly so well as this. Though it is in a young wood, surrounded but not overcrowded or dominated by other trees, and has therefore been well sheltered, and had every chance to develop, it has evidently borne out ELWES'S statement that the species suffers here from spring frosts. The best is only 11 feet, and another 9 feet 6 inches, high, while neither has any other dimensions worth recording. I have referred already to the winged leafstalks and narrow upright wings of the nuts which are the distinguishing marks of the species. The best plant at Kew, obtained in 1891, is now 20 feet high with a girth of 21 inches at

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1 foot above ground ; it will be noted that, as at Aldenham, this species has made inferior progress to that of both *P. rhoifolia* and *P. Rehderiana*.

ZELKOVAS.

The Zelkovas form a small, wholly deciduous, and perfectly hardy genus, closely related to the elms, which has not, in my judgment, received the attention from arboriculturists that it deserves. It is quite true that none of the species can claim the brilliantly coloured flowers which make a Judas tree or a Wistaria so attractive, nor the gorgeous autumn tints which cause *Nyssa sylvatica* or *Liquidambar styraciflua* to be the ornaments of a dying year. Nevertheless, if grace and elegance of form can be held to equal showiness of colour, then the Zelkovas—or Planeras, as they used to be called long ago when I first began to take interest in exotic trees—can hold their own with any, and are eminently fitted to adorn any garden or pleasure-ground, and I for one think it a pity that they are so seldom to be found even in important collections. The genus comprises in all only six species, though there may of course be others awaiting discovery in China, that richest of all countries from the floral standpoint.

Setting aside the shrubby Cretan species, *Z. cretica*, which is not in cultivation, there remain five, all of which can be seen at Kew and Aldenham. It may well be due to my ignorance, but it is a fact that I know of no other place in Great Britain or Ireland of which this can be said ; not that I should be surprised to hear that they were all represented at Les Barres in the arboretum of M. JACQUES DE VILMORIN, son of my old friend Monsieur MAURICE, who was cut off, alas ! all too soon by death from his useful activities.

Zelkova acuminata, of Japanese habitat, has been in this country sixty-four years, but is still unfortunately quite rare here. It has been alleged by some, as for instance in Mr. BEAN'S work, that this species also has a natural home in China, but the author has explained to me that the statement was made because at the time of writing and until quite recently *Z. sinica* (which will be dealt with later in this article) was thought to be identical with it. In the case of a country so vast, so rich, and still so imperfectly investigated as China, it might be unsafe to assert positively of any given plant that it did not exist within its widespread borders, but it can be said with certainty that the true *Z. acuminata* has not been yet found growing wild there. It has a beautifully smooth grey trunk, and long tapering foliage with strongly toothed edges. In its own country it is said to exceed 100 feet in height, but there is no sign of its emulating that figure here. I do not know what it might do if planted in close canopy and driven upwards by its neighbours ; but grown as an isolated specimen, as I have always seen it, the head soon broadens out with a quantity of slender boughs somewhat pendulous in character, and, though very ornamental, it does not offer much promise of making a great timber tree. The best specimen at Aldenham is 25 feet high, and has a perfectly clean stem,

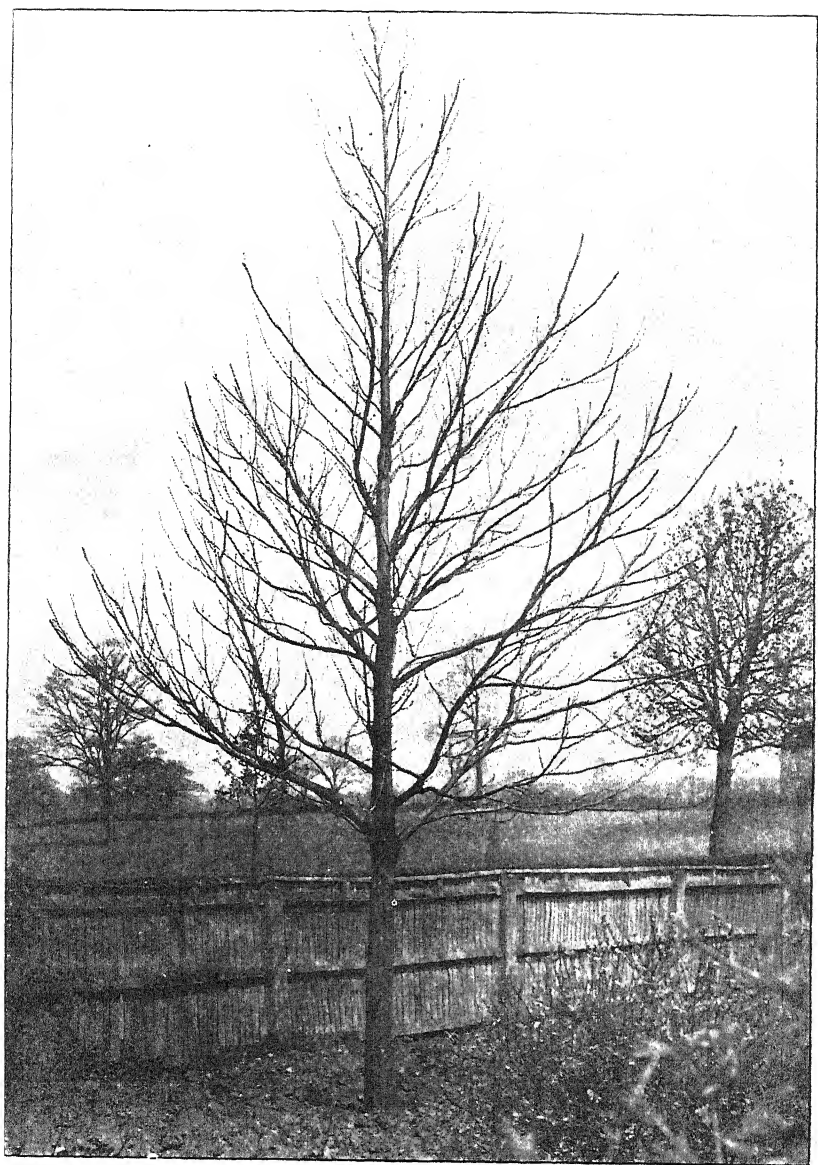


FIG. 74.—*PTEROCARYA REHDERIANA* AT ALDENHAM.

[To face p. 236.]

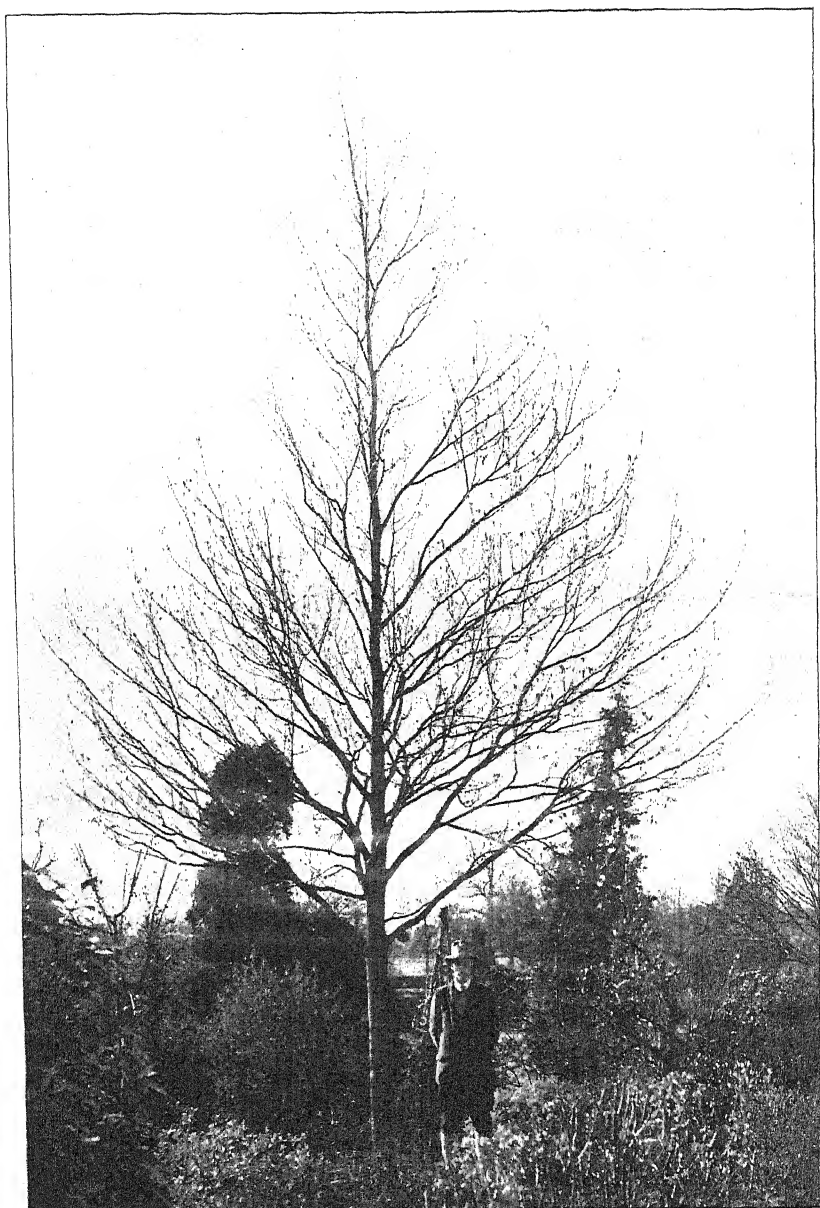


FIG. 75 —*PTEROCARYA RHOIFOLIA* AT ALDENHAM.



FIG. 76.—*ZELKOVA CRENATA* AT ALDENHAM.

[To face p. 237.

girthing at 4 feet above ground 22 inches, and a spread of branches over 20 feet across. Its age is approximately thirty years. Although these trees are so closely related to elms, yet their stems are much more like those of beeches, being quite smooth and without corrugation; nor do they share with elms the untidy and disfiguring habit of throwing out from the main trunk a lot of weak twigs that never become real boughs, and which are freely produced, particularly where a big bough has been removed. For comparison I give the figures, kindly supplied me by Mr. BEAN, of Kew's best; they are, height 30 feet, girth 3 feet 11 inches, approximate age 60 years. It will therefore be seen that, allowing for the fact that my plant is only half the age of the Kew one, it has thriven the better of the two.

Z. crenata has been domiciled in England much longer than any of its congeners, and has had time to reach maturity; though even this must be described as rather rare, it is much the most often seen here of any of the genus. It has a smooth, perfectly clean grey stem, similar to the one previously described, but after going up about 8 feet it breaks into a number of small crowded branches and forms a broad shapely head which lacks the pendulous character of *Z. acuminata*, from which it is also differentiated by the down on the twigs and on the underside of the somewhat smaller leaves. It is, too, a stronger and, generally speaking, a faster grower than the preceding. *Z. crenata*, when it has reached full age, often acquires striking buttresses to the stems, as can be seen in the grounds of Sion House. The timber being tough and elastic, with pretty veining, would be specially suited for cabinet work if only enough of it could be acquired at a reasonable price. This species hails from the Caucasus, and was introduced here as early as 1760. Mr. BEAN eulogizes it as "one of the most picturesque and distinct [trees] that can be grown in this country," and I confirm his estimate, though for charm and grace I am inclined personally to place *Z. Verschaffeltii* at the top of the genus and *Z. Davidiana* at the bottom. It is stated by ELWES and HENRY to be given to sending up suckers from the roots, a habit which, however useful for the supply of young plants, does not look very tidy in a garden. My best specimen (fig. 76), though still in its youth, has produced a good many, which have been lifted and are now thriving in the Nursery. It is approximately aged thirty, is about 35 feet tall, with 25 to 30 feet in the spread, and girths 40 inches at 4 feet above ground. These measurements are, however, very "small potatoes" indeed as compared with the size of the old trees at Kew, Wardour Castle, Sion House, and Holme Lacy. Nevertheless, allowing for its comparative youth, no tree could show better promise than mine does, and, failing a rich loam, it evidently does not resent our heavy clay nor our early and late frosts. The figures of the finest Kew tree, and very fine that is, are: height, 66 feet; girth (at 4 feet), 10 feet 3 inches; having reached the mature age of approximately 165 years without showing any signs of senility or decline.

Z. Davidiana is quite unlike any other known member of the genus.

In this case the boughs are neither slight in girth nor closely crowded, and the stiff stout thorns with which it is armed form a marked individual feature. Except for these it is superficially much more like an elm, and particularly *Ulmus pumila*, than it is like the other members of its own family; so much is this the case that some botanists are inclined to separate it from the *Zelkovas* under the generic name of *Hemiptelea*. M. MAURICE DE VILMORIN gave it to Kew in 1908, having imported it from Central China to France not long before. Though I have neglected to make any note of the fact, I suspect that I owe the presence of my two specimens to the same good friend. They are doing well with me, and in common with all the others seem absolutely hardy in our unusually cold climate, which is indeed no small merit. One of my plants lost its centre and is now making a very strong bush; the other measures 14 feet in height, has a spread of 11 feet, and a girth at 4 feet above ground of 10 inches. In age I take it to be about seventeen years. Mr. BEAN gives me the height of the best specimen at Kew as 11 feet, with a girth of 1 foot 3 inches. I have no doubt that both mine and the Kew plants came from the same source at the same time, and it will be observed that though mine is a little more slender in girth it tops the other in height by 3 feet.

Z. sinica is the most recent arrival in this country; in fact, it came too late to be described in BEAN'S admirable book (2nd edition, 1916), from which so many of us glean our information about shrubs and trees. We owe its introduction to Professor SARGENT, who sent the seeds both to Kew and to Mr. F. R. S. BALFOUR in June 1920, having obtained them from Northern Honan in China. It is early days to give any confident account of its habit, but in its young state at any rate it can be pronounced a fast grower; already I have been compelled twice to shorten the leading shoot by about a foot, as it was running up so rapidly as to become weak and whippy, and to render it quite impossible for it to carry itself erectly, unless supported by a stake—a method to which no one should have recourse except when absolutely necessary, for against it is to be set not only the cost of constant renovation through breakage by gales, but grave risk of injury to the live bark from chafing, unless great care and watchfulness be observed.

I have several examples, some of which are due to the generosity of my old friend Mr. GERALD LODER and others to the benevolence of the Director of Kew, all being doubtless of the same age as those growing in that Mecca of botanists, where they were raised from seed. My finest plant is 7 feet 6 inches high, but has not yet any girth or spread worthy of record. The best specimen at Kew is, I am informed, 9 feet high, and mine would have been the same had I not, as mentioned above, cut it back. So far as can be judged from its very short career in England this species is doing very well, and equally well on the heavy clay of Aldenham and on the far lighter soil of Kew.

My helpful friend, Mr. BEAN, has allowed me to make use of the botanical description of this tree which he proposes at some date to

insert in an appendix to his work on "Trees and Shrubs," and since, so far as I know, this has not yet been given publicity in this country, I feel that I cannot do better than reproduce the bulk of it. It runs thus :

"*Zelkova sinica* (Schneider) : A deciduous tree up to 50 feet high, with a trunk up to 6 feet in girth ; young shoots greyish woolly in the early part of the season, becoming brown and smooth by autumn. Leaves firm in texture, ovate to ovate-lanceolate, rounded at the base, the apex mostly slenderly pointed, the margins rather coarsely toothed, ciliate ; veins seven to nine each side of the midrib, each one running out to the point of a marginal tooth ; 1 to $2\frac{1}{2}$ inches long, $\frac{3}{8}$ to $1\frac{1}{8}$ inch wide ; dark dull green and harsh to the touch above, greyish beneath and downy, especially on the midrib and veins ; stalk very short, downy. Flowers not known to me. Fruit solitary as a rule, produced from the underside of the leaf axils, irregular globose in shape, $\frac{1}{8}$ inch wide, veined, downy in parts.

"Native of W. Hupeh, Shensi, and other provinces of China. WILSON describes the bark of the trunk as smooth and pale grey, peeling off in thin flakes. From *Z. acuminata* it differs in its smaller leaves being downy beneath and in having a shorter point and fewer veins."

Z. Verschaffelti, the last and fairest of the flock, is described by Mr. BEAN as taking the form of a bush quite as often as that of a tree, unless pruned so as to compel it to adopt the latter habit. It is true that I have but one specimen, and there is no more dangerous habit, to which we are all of us prone, than that of drawing general inferences from the few particular instances in the writer's own grounds. Still I am bound to say that my example is entirely a tree, though a small one, and has nothing bushy about it, yet to the best of my knowledge and belief it has never been trained, or manipulated at all by the removal of shrubby growth at the base, to make it take on the satisfactory appearance which it now presents. It shows the same clean and quite vertical stem which is typical of the better known *Z. acuminata* and *Z. crenata*, while the head with its slender twigs and graceful foliage is, if possible, even more attractive. The leaves are much the same in size, and are so coarsely toothed as to give the tree the effect of being lacinated, i.e. cut-leaved, a form which always has charm in many different genera, such as Beech, Birch, and Lime. No wild specimen has yet been found, and DIPPEL merely hazards a guess that its habitat is Eastern Asia, while Mr. BEAN, basing his opinion on its affinity to *Z. crenata*, inclines to the Caucasus. As to Dr. HENRY's suggestion that it is a hybrid of "crenata" and "cretica," I confess that, with all respect to that eminent botanist, it seems to me fantastic, for he offers no evidence as to how these two trees could have had the opportunity of interbreeding, even if they were so disposed. The tree was first domiciled at Kew in 1900, and at Aldenham, I should guess, about ten years later ; both specimens have shown themselves to be hardy, healthy, and slow growing. For all these reasons, and for its beauty, it would

be entirely suitable even for a small garden; yet these two and one in Mr. LODER's beautiful grounds at Wakehurst in Sussex are all that I have ever come across, so far as I can remember. My plant measures 13 feet in height, girths 1 foot at 3 feet above ground, has a spread of 10 feet across, while the height of the stem, before it splits up into small boughs, is 4 feet 6 inches. The tree at Kew is 20 feet high, with a girth of 1 foot 9 inches at 4 feet above ground.

I hope that these rough notes may lead some who are interested in choice broad-leaved trees to obtain some of these species. No doubt the acquisition of the rarer ones might present difficulties, but this does not apply to *Z. crenata*, which has proved its worth and its power to develop into a grand old tree in England, and possesses moreover the great advantage that it is not at all particular about the soil or the climate in which it is placed, whilst its habit of suckering lends itself to the easy production of young plants on their own roots. During this spring I have been trying to graft the rarer kinds, using as stocks both *Z. crenata* and elm, and if the experiment should prove a success I think that many collectors would prefer even grafted plants to having to do without these charming species altogether.

I cannot conclude this article without expressing my obligation to my old friend Mr. BEAN for the help which his book has given me when writing it. I know that he has too generous a disposition to resent any "cribbing" on my part, even though he might be the first to detect it.

SOME CONCEPTIONS OF THE LEAF-MEMBER,
OLD AND NEW.

By EDITH R. SAUNDERS (Fellow of Newnham College).

[Read December 2, 1924; Dr. A. B. RENDLE, M.A., in the chair.]

WE are accustomed to recognize in the body of vascular plants three types of organs—roots, stems, and leaves. In the case of the flowering plants proper we indicate the young stem-leaf complex in the vegetative part by the term “shoot,” and speak of the component structural units of the reproductive region as the “flower.” I propose here to attempt briefly to expound certain new considerations regarding both shoot and flower affecting the relationships (1) of *foliage* leaves to the stem, and (2) of *the ovule-bearing members of the flower, the carpels*, both to the axis and to one another. These conceptions, as will become apparent, enable us to interpret many morphological features hitherto appearing to be without significance, and they profoundly affect our notions of the construction of the female organ of reproduction—the ovary.

I will deal first with the vegetative shoot. We are familiar with the fact that leaves arise on the stem in orderly sequence, spaced equally apart in the horizontal direction, so that when they are borne singly at the nodes a line joining the successive points of exsertion forms a continuous spiral. Where two or more leaves occur at the same node, they are also similarly equidistant from each other, and have their exsertion centre vertically over the point midway between the exsertion centres of the leaves of the preceding whorl.

It has always been recognized that in some plants the leaves are definitely prolonged downwards for some distance below the level of exsertion, such downward extension, though it may be sharply delimited, being fused at its boundaries with neighbouring leaf extensions and on its internal face with the stem. Leaves showing this character are described as decurrent, the condition being well seen among many of the Conifers, as e.g. in *Abies*. This condition has been regarded in the past as quite exceptional, and as occurring only in plants in which the even contour line of the stem is seen to be broken by the formation of a distinct flange or wing of tissue continuous with the leaf, or in which the stem surface shows in less conspicuous form a definite pattern outlined in relief which is clearly composed of the leaf tissue. But, in fact, we have but to look further to see that this decurrent condition is of universal occurrence in all plants in which stem and leaf are differentiated. Throughout Dicotyledons and Monocotyledons, in the Conifers, the Ferns and their allies, *the stem axis is enveloped in a continuous skin formed by the extension of the foliage leaves below the*

level of their exsertion. We thus come to realize that the structure which is free from the stem axis, which we have been in the habit of regarding as the *whole* leaf, may in some plants constitute only a small portion of the entire leaf area, as e.g. in those Leguminosae having whip-like stems (species of *Cytisus*, *Genista*, *Spartium*) where the free portion forms a minute scale, while the region fused with the stem extends downward for perhaps two to three inches or more, according to the length of the internodes. Or, again, in the so-described "bractless" inflorescence of the Cruciferae, where in most cases the exerted portion of the bract has actually reached vanishing point, the downward extension alone is developed. This brings us to a consideration of the nature of the evidence upon which the conception of the leaf-skin is based.*

In order to obtain clear and convincing evidence of the presence of this leaf-skin we must choose our material; for in the great majority of plants the fusion of the leaf extensions along their lines of contact is so complete that no definite boundaries can be traced. The stem presents a uniform surface which tells us nothing. But in other cases this fusion is apparently so slight that the lines of contact constitute, as it were, *potential* edges, and, as such, may exhibit some of the characteristics of *actual* edges. For example, they may be marked by the formation of outgrowths in the shape of ridges or lines of hairs, or the boundaries may be traced by the distribution of anthocyanin. We find an excellent illustration of ridged contact lines in the stem of *Calystegia*, where these extensions often reach downwards for six inches or more, and again in the stem of the Pansy. In the latter case it can be plainly seen that from each leaf exsertion two descending ridge lines, one on either side, run down the stem, the one being always traceable through one internode, the other through two. This long-and-short pattern is conditioned by two circumstances. It depends upon (1) the particular scheme of leaf arrangement (phyllotaxis), (2) the breadth of the leaf at its exsertion level. These two factors determine the surface pattern of ridge or hair lines when present—characters which previously had not appeared to have any particular significance. Now it follows from what has gone before that no portion of the stem surface is anywhere really naked. The whole axis is clothed by the contiguous and coherent basal continuations of the leaves, which form an adherent skin to the axis. This conception holds good equally in the region of the *floral* axis, and, as we shall see presently, enables us to interpret various structures which hitherto have presented a certain difficulty. Thus, in the case of, say, a two-foot stemmed Tulip, the downward extensions of the perianth, although we cannot detect any demarcation lines marking the junction laterally of each with its neighbour, so complete is the fusion, extend down the whole two feet. Similarly in the case of flowers showing the development of an internode between the calyx and the

* For an account of the leaf-skin theory of the stem see *Annals of Botany*, 36, April 1922.

corolla, as in *Lychnis Flos-Jovis*, the downward extension of the petals attains an appreciable length. In the case of the Passion Flower an internode is developed between the corolla and the androecium, and it is the staminal leaves whose downward extensions become elongated to a corresponding extent. And, finally, we will turn our attention to the carpels. Until recently it had always been universally accepted by botanists—LINDLEY, his contemporary KUNTH, and KERNER, who adopted LINDLEY's view, excepted—that carpels are all fundamentally similar, representing a leaf more or less curved or folded lengthwise and inwards, bearing the ovules along its margins which constitute the placentæ. The two edges of an individual carpel may be joined together, each carpel being then separate and distinct. We then have the type of placentation described as *marginal*. Or each carpel may be united with its neighbour on either side, the right edge of one to the left edge of the other. If the carpels are so joined as to enclose a single cavity, the placentation is termed *parietal*; but if they develop in such a way that the sides of two neighbouring members are never dissociated from each other and are not withdrawn from the centre, the ovary is completely partitioned and the ovules arise on the central column of tissue formed by the carpel edges. This arrangement gives rise to the mode of placentation which we call *axile*. The carpel midrib usually gives rise to a more or less well-developed venation system, as in an ordinary foliage leaf, and the mode of origin of this system is of great importance in enabling us to understand the construction of the ovary. The carpel itself may end directly in the stigma: or it may be prolonged above into a style, in which case the midrib bundle is continued up also, the stigma in either case being centred over the midrib. Now these conceptions of the carpel, though they suffice up to a point to explain the construction of the ovary, leave many anatomical features unaccounted for, some of which indeed appear to be irreconcilable with them. The greatest difficulty in this respect is perhaps the so-called "commisural" stigma—that is to say, the stigma which is centred, not *over* the carpel midrib as the orthodox view demands, but *midway between* two midribs, or, in other words, over the suture formed by the conjoined edges of two adjacent carpels. This anomaly is most familiar to us in the group of families included in the Rhoeadales, viz. the Papaveraceae (including Fumariaceae), Cruciferae, Capparidaceae, and Resedaceae, and in the Order to which the Heaths and their allies belong, but it is also to be met with in many isolated genera up and down the whole range of flowering plants. Anyone who looks at a Wallflower or a Poppy, for example, can easily see that the conspicuous stigmas are not superposed upon the carpel midribs, but stand midway between them.

In the case of the Poppy capsule, in which the stigmas appear as (generally) ten rays upon the disc-shaped summit, these stigmatic rays can often be seen to consist of a double band of hairs, which converge and join at the edge of the disc so as to form a V, in which the sides are very nearly parallel. Now this appearance led to a

plausible explanation of the anomalous position of the stigma. It was contended, although no actual evidence could be adduced in support of the theory, that the stigma proper becomes split in two, that the halves diverge, and that each becomes fused with the adjacent half stigma of the neighbouring carpel on the corresponding side, and thus accounts for the commissural position. In some cases supposition has to be carried further still to meet the facts. In the Monocotyledon genus *Paepalanthus*, closely allied to the Pipewort (*Eriocaulon*), the ovary bears three filamentous structures in the position where the three styles might be expected to be, but although they have the appearance of being styles they do not function stigmatically. Alternating with these three so-called appendages, and therefore superposed over the three partitions dividing up the cavity of the ovary, are three frequently forked structures on which the pollen grains germinate. In order to account for the presence of these two sets of structures, it is necessary on the orthodox view to make three separate assumptions, for not one of which is there any evidence forthcoming. These assumptions are, firstly, that the carpels split at their apex into three prongs; secondly, that the centre prong, which occupies the position and has the appearance of a style, is not a style, but a mere functionless appendage; and, finally, that the two lateral prongs have in each case diverged and have fused for the whole or part of their length with the adjacent prong of the neighbouring carpel on either side to form the functional styles. Other examples could be cited, in which recourse has to be made to what are pure morphological fictions in order to reconcile appearances with the current view of the monomorphic carpel. But if we suppose that in the course of evolution the carpel, like any other member of the plant, has undergone differentiation, and that this differentiation has been accompanied by division of labour, we find that the anomalies to which I have referred above no longer present any difficulty. We find, in fact, that there appear to be at least three common carpel types: the valve, the solid, and the pseudo-valve (or semi-solid). The valve type, the only one hitherto recognized, is more or less leaf-like in form, expanded and hollow, with midrib from which arises a more or less developed system of lateral veins with their reticulations, and which, when fertile, bears the ovules *on its margin*. The solid type, in which the carpel has become contracted or "consolidated," consists generally of a mere column (more rarely of a radial plate) of tissue with a main vascular cord or midrib, and bearing ovules when fertile *on either side of the midrib*. The pseudo-valve, or semi-solid type, is intermediate in character between the other two; from the exterior it has more or less the valve form, but it differs fundamentally from the valve carpel, and resembles the solid type in having the ovules shifted from the margins to a position on either side the midrib. With this differentiation there has come about a redistribution of the three carpellary functions—protective, receptive, and reproductive. No one function is definitely restricted to one kind of carpel, but where more than one type is present only one kind appears to be fertile,

while the stigmatic and protective functions are performed sometimes by the fertile, sometimes by the sterile members.

Having thus briefly outlined the idea of the polymorphic carpel,* we will now see how the conception provides a solution of the anatomical puzzles to which I referred above. In the Cruciferae, of which we may take the Wallflower as an example, we have to account for the commissural stigma, the presence of double contour lines where the carpel edges meet, the late development and morphological nature of the spurious partition (the replum), and the fact that when the siliqua is ripe the appearance is as of the placental edges of the two carpels tearing away from the body of the carpels and remaining together with the seeds attached to the false partition. Now, according to the usual view that the ovary of the Wallflower consists of two valve carpels, we are unable to explain any of these features. We have to admit the existence of these anomalies and to leave the matter there. But on the view that the ovary is composed, not of two carpels but of four, two of which are of valve form and fulfil the protective function alone, being neither stigmatic nor fertile, while the other two are of the solid type and both stigmatic and fertile, the position of the stigmas, the presence of the double contour line on the surface of the siliqua, and the mode of dehiscence of the fruit are fully explained. The development of the so-called false partition results from further growth of the solid carpels in the direction of least resistance, i.e. into the ovary cavity, as development proceeds.

The siliqua-like fruits of certain Fumariaceae, as e.g. species of *Corydalis*, present similar features which are capable of being similarly explained. One member of this genus—*Corydalis* (*Platycarpus*) *heterocarpa*—is peculiar in forming two kinds of fruits, those first produced being urn-shaped, whilst those which are formed later are siliqua-like. We appear to have the siliqua actually being evolved here under our eyes, the first fruits consisting of carpels which are alike in outward form, those which succeed them showing the typical two pairs of dissimilar carpels. Similar cases of dimorphic fruits occurring in the Cruciferae can be explained in the same way.

The Papaveraceae show the same combination of valve and solid carpels as the Cruciferae, but here the number of carpels is rarely as few as four (*Glaucium*, *Chelidonium*, *Bocconia*); it is eight, for example, in the Welsh Poppy (*Meconopsis*), and ranges up to twenty or more in *Papaver*. No one, it seems to me, who has ever seen the skeletonized capsule of a Poppy can continue to hold the old view that the massive placental cords are merely the fertile edges of the intervening valves, which themselves have but very poorly developed midribs. On the polymorphic view we are not only able to account for the position of the stigmatic rays, but we see also that the mode of dehiscence by means of pores is in no way an exceptional process, but

* For a fuller account see "A reversionary character in the stock (*Matthiola incana*) and its significance in regard to the structure and evolution of the gynoecium in the Rhoeadales, the Orchidaceae, and other families," *Annals of Botany*, 37, July 1923; and "On Carpel Polymorphism, I.," *Annals of Botany*, 39, January 1925.

is due to the separation of the valve carpels at their apex from their solid neighbours. I might add in passing that a picture of the complete vascular system, such as is obtained from a skeletonized fruit, is extremely instructive, and we might with advantage revive this lost accomplishment of a past generation. Among the Papaveraceae, however, the most interesting genus from our present point of view is undoubtedly *Eschscholzia*. The ovary is described as having generally two, but sometimes four stigmas. The fruit, as will be recalled, splits when ripe into two five-ribbed valves, to which the replum frame usually adheres, though it can be detached without difficulty. As in some other Papaveraceous genera, it has always been held to consist of two carpels. Now, in the early part of the season, one may occasionally find individual flowers with eight, twelve, and even sixteen stigmas. There can, in fact, be no doubt that the ovary is in reality composed of twenty carpels, made up of five rib carpels on each side, four valve carpels alternating on each side with the rib carpels, and the two forming the replum frame. As a rule, either the central one of the five rib carpels alone, or these and the replum carpels as well, produce stigmas, but occasionally in the early flowers *all* the rib carpels may succeed in becoming functional, and even some of the valve members may do so. We have undoubtedly in these cases a partial reversion to the ancestral condition, where presumably all twenty carpels were stigmatic.

In the Mignonette family the same process of consolidation furnishes us with a clue to the number and position of the stigmas in *Reseda odorata*: they may be present over sutures as well as midribs—that is to say, over what are really semi-solid fertile carpels alternating with the sterile ones which have become contracted from the valve almost to the solid condition. Having established the fact that not three carpels merely but six are present, we are able to understand how it can come about that where there are but three placental cords the unpaired one should be anterior in one species (e.g. *R. odorata*) and posterior in another (*R. luteola*).

Let us now take a family from quite another Dicotyledon group, viz. the Leguminosae, and consider some of its genera from our present point of view. Hitherto the fruit characteristic of this family, the legume, has been looked upon as a typical one-carpelled fruit. This, however, now appears not to be the case. From examination of such genera as *Arachis* (the Pea- or Monkey-nut) and *Scorpiurus* one finds that the number of carpels in the sub-family Papilionaceae may be as many as ten (or even more in individual fruits). This is particularly well seen in *Arachis*, where it is only necessary to remove the thin papery epidermis in order to see plainly the ten (or more) vascular cords extending up on all sides of the fruit to the apex and passing below separately into the flower stalk. Here we have retention of the (probably) full carpel number with complete “consolidation,” and one only remaining fertile. Precisely the same process has gone on in *Scorpiurus*, but here the median front carpel has retained its valve form. All the others have become “consolidated,” and, out-

growing in length the one more expanded valve carpel, bring about the characteristic spiral coiling.

In the typical legume, however, which is characteristic of the great majority of the genera, the number of carpels has been reduced to two (not one), the fertile vexillary member being semi-solid, the other sterile and either semi-solid also or solid. This can be made out in the inflated semi-transparent pod of *Colutea*, which shows the main lateral vascular system arising in symmetrical fashion from the placental cords, i.e. from the twin bundles forming the midrib of the fertile carpel, the midrib of the sterile carpel forming few if any lateral branches. The same relations can be easily seen in some smooth-fruited Medicks, as e.g. *Medicago orbicularis*. Here also the lateral venation arises from the semi-solid fertile member. The solid sterile member outstripping the fertile carpel in growth in length, the fruit necessarily takes on a spiral form. The two-carpelled construction furnishes an explanation also of the partial partition formed in the ovary of species of *Astragalus* and *Oxytropis*, and accounts for the mode of dehiscence of the pod of *Haematoxylon campechianum* (belonging to the sub-family Caesalpineae), which when ripe ruptures down the middle of each flat face instead of down the edges, the two carpels in this case developing about equally, whereas ordinarily the fertile carpel forms much the larger portion of the pod.

Very interesting examples of somewhat similar character, and hitherto equally inexplicable, occur among the Berberidaceae, viz. *Epimedium* and *Vancouveria*. The ovary in these genera has always been held to consist of a single valve carpel, despite the fact that it shows two distinct systems of venation, one arising from the but slightly developed midrib, the other from the massive placental cord. These two systems may come into contact, but they do not become continuous. The single style and stigma stand not over the midrib, but over the placental cord. The fruit when ripe splits more or less vertically by the tearing of the non-vascular tissue between the two venation systems. These features are quite irreconcilable with the one-carpel view, but they are completely in accord with a two-carpel construction, in which one of the two is larger, semi-solid, fertile and stigmatic, the other sterile, small, valve-like and merely protective.

To turn to yet another family—the Geraniaceae. Here we find the conception of the leaf-skin of assistance in enabling us to solve the problem presented by the appearance of the fruit. The genera *Geranium*, *Erodium*, *Pelargonium* have two whorls of stamens which appear to transgress the law of alternation, since the outer whorl stands opposite the petals and the inner opposite the sepals. The ovary is described as consisting of five carpels whorled round a prolongation of the axis—the carpophore—and they, too, are placed not where we should expect them, i.e. opposite the sepals, but on the other set of radii opposite the petals. Now the explanation of these anomalies is to be found in the fact that the number of carpels is not five, but ten in two whorls of five. The beak which remains when the five fertile carpels have split away is not the axis, but is composed of

five other carpels which have never bent outwards to form a loculus. They have remained in their central position and have become solid. Were the beak tissue between each of the fertile carpels really axis, its surface should be clothed with the downward extension of another whorl of floral members exerted at a higher level, but, as we know, no such whorl exists. Now this whorl of solid carpels is in reality the outer whorl of the two, its members standing opposite the sepals. Owing to the fact that they have not curved outwards and become hollow, the whorl of stamens on the same radii has not been pushed outwards; and hence it results that what is really the *inner* whorl of stamens lying on the radii of the petals and of the fertile carpels comes to stand outside them. We thus obtain a rational explanation of the condition of obdiplostemony and of the apparently anomalous position of the fertile carpels which is characteristic not only of the Geraniaceae, but of the allied families of Oxalidaceae and Linaceae. It is of interest to note that in Linaceae, where the ten carpels composing the ovary are not of two different types but all of the same kind, there is no appearance of obdiplostemony.

Among Monocotyledons we can find equally striking evidence of the general tendency to reduction and consolidation of the carpels. This can be well seen in process of taking place in the genus *Triglochin*. In *T. maritima* the ovary shows six equal loculi and is composed of six carpels, all similar. In *T. palustris* three carpels only remain fertile and form loculi; the other three have already lost the valve form and become solid, possibly a preliminary step towards complete disappearance. This case is particularly interesting, as showing that the same forces are at work where the carpels are separate as in the more frequent case where they are all conjoined. We find again a very instructive series among certain genera of the Liliaceae, in which the characteristic nectar gland, with its slit-like lumen, is absent from the partitions which divide up the ovary cavity, viz. *Fritillaria*, *Tulipa*, and *Lilium*. According to received opinion the number of carpels present is three, but, as we shall see, it is in reality six. At one end of the series stands *Fritillaria Imperialis*, whose six-angled fruit is derived from six semi-solid carpels, three of which are large and fertile, the alternate three smaller and sterile. The midribs run up the middle of each of the six flat sides. Each gives rise to a system of lateral veins which terminate in the six flanges or protruding angles representing the six lines of junction. The ovules are borne on either side of the midrib of the three large carpels. It follows that the two vertical rows of seeds in each loculus do not arise from the two edges of one and the same carpel, but from the right and left half respectively of two different carpels. The midribs are formed of twin vascular bundles, and when the fruit is ripe loculicidal dehiscence occurs through the splitting of the fruit wall between the pair of vascular bundles of the smaller sterile carpels. In *F. Meleagris* the sterile carpels have contracted to a mere column of tissue composed of the midrib with some surrounding tissue and an outer and inner epidermal layer, the former passing imperceptibly into, the latter being sharply delimited from the epi-

dermis of the contiguous fertile carpels. In the Garden Tulip the process of reduction has proceeded a stage further. The solid carpels have now become partially engulfed by the neighbouring fertile carpels, and where in *F. Meleagris* an arc of inner epidermis is plainly seen we now find that this has disappeared, and that in its place there occurs a cleft in the thickness of the ovary wall, showing where the neighbouring carpels have closed over the intervening carpel midrib, although their edges have not yet become fused. In *Lilium* this fusion has taken place; the solid carpels, now reduced to their midribs, are completely engulfed, and the longitudinal furrow visible at the angles on the outside of the fruit alone remains as indication of the process which has led to the obliteration of the three sterile members. We are now for the first time able to account for the position of the stigmas in the garden Tulip. On the orthodox view they must be held to be commissural, but now that we recognize the presence of six carpels, the centring of each semi-lunar stigma structure over the partitions at once becomes intelligible.

Certain puzzling features in the fruits of various Orchids also now fall into line. According to received opinion the unilocular ovary is constructed of three valve carpels, the placentation is parietal, and the stigmas commissural. Upon this view the splitting of the fruits of such genera as *Miltonia* and *Leptotes* into three broad and three narrow segments is inexplicable, but neither the mode of dehiscence nor the position of the stigma presents any difficulty when it is grasped that the three narrow segments represent three sterile solid carpels, and that the stigmas are borne by the three semi-solid (or pseudo-valve) fertile carpels.

The examples which have been cited will suffice to show that polymorphism of the carpels is a widespread phenomenon. We may infer from the evidence that there has been an almost universal tendency in the course of evolution to reduction in number. When the full number is still retained there is often diminution in bulk, and most or all of the carpels may become solid. When reduction in number takes place and is accompanied by polymorphism, the result often indicates a condition of balance between the different carpel types, which in most cases belong to different whorls. For example, if one carpel set remains valve-like the other often contracts and becomes solid. On the other hand, if the outer whorl contracts from the valve to the solid type the inner whorl often remains expanded, but assumes the semi-solid instead of the valve form. One is led to speculate whether polymorphism may have come about as a means of enabling the dry type of fruit to dehisce more easily. In certain reversionary types of fruit, as e.g. in typical fruits of *Capsella Heegeri*, and in certain occasionally-formed fruits in the Stock, where the meeting edges of two carpels contain no vascular tissue, dehiscence becomes difficult or impossible. On the other hand, the presence of a strongly-developed vascular cord in a solid carpel will render much easier rupture between it and the soft tissue of a neighbouring carpel. Herein then, perhaps, we have the clue to the origin of the polymorphic condition.

SOME WILD SPECIES OF TULIP.

By W. R. DYKES, M.A., L. ès L.

ONE of the virtues of a florist variety of garden Tulip is that all the individuals should be absolutely alike and the bed of them perfectly regular. This regularity comes from the fact that all named garden Tulips are the result of increase by offsets from an individual bulb in each case, and that all offsets from one bulb produce eventually flowers which are identical. Among the wild species of Tulip, on the other hand, there is infinite variety, and the fact that many of them hardly ever, and sometimes never, produce offsets has the result that each individual is a separate seedling and that no two individuals are exactly alike. It is, however, precisely this variability which provides a lasting interest for those who grow these species of Tulip, and if a few simple rules are followed there is no difficulty whatever in cultivating them.

The soil in which Tulips are grown should always be well drained and should contain lime. Bone meal dug into the ground before the bulbs are planted is an excellent manure.

Another rule is that the bulbs should never be planted before the beginning of November, and preferably not until the second week of that month. Obviously, if there are a great many to be planted and if the working hours of daylight are limited, it is sometimes necessary to begin in the last week in October and to continue to plant throughout the whole of the following month. The ideal time is about the roth of November.

A curious fact that is not, apparently, at all widely known is that if for any reason Tulip bulbs have been overlooked and remain out of the ground until after Christmas it is better to store them in a dry, well-ventilated, and frost-proof shed until the following November than to plant them in January or February. Slightly smaller bulbs will form inside these bulbs and these new bulbs are quite capable of flowering in the following year, whereas bulbs that are planted very late after Christmas endeavour to form leaves and flowers in a very short time, and, as a result, produce less good bulbs for the following year than those that have remained out of the ground altogether.

The one essential rule in cultivating wild Tulips is that the bulbs should be dug up every year and stored in a warm dry place until November. It is perfectly true that in some gardens, and especially if they are planted among the roots of shrubs, some species will live on from year to year and flower fairly well; but sooner or later there will come a dull summer when the bulbs are not very well ripened, followed by a spring when late frosts play havoc with the leaves, and then the bulbs will be weakened, even if they are not killed entirely.

A Tulip bulb only lives through its leaves: that is to say the new bulb which forms for the following year owes its strength to the foliage thrown up by its predecessor. If this develops strongly and is undamaged then a fine new bulb is formed.

The annual lifting of the bulbs is a somewhat tedious process, but it enables the bulbs to be stored in a warm dry place, which completes their ripening. Those, however, who possess a large stock of any species may well try the experiment of planting some bulbs six, eight, or even twelve inches down in a well-drained position, and possibly within reach of the roots of some shrub, which will suck the moisture out of the soil in summer and so produce warm dry conditions. In such a place even *Tulipa saxatilis*, one of the most difficult to flower, has been known to flourish and flower freely.

One of the difficulties in writing of Tulip species is that, owing to the separation between botany and horticulture which has persisted so long, there is very great difficulty in determining the proper names of many of the species. It is easy for a botanist to describe an individual Tulip and to give it a name; but when the specimen has withered and faded, even if it is properly preserved in an herbarium, it is almost impossible to identify the plant with any certainty by reference to his description and the specimen. Thus the earliest species to flower, which is usually some form of *T. biflora*, may be one of three or four forms which are perfectly distinct when grown side by side, but of which examples collected in the wild state and examined as herbarium specimens could almost certainly not be separated. These small Tulips from Southern Russia and the countries to the east have small starry flowers, of which the inner surface is white with a yellow centre and the outer petals backed with some combination of green and purple. The number of flowers may vary from one on a weak bulb to two or four or even as many as ten or twelve in the form which is sometimes known as *T. turkestanica*. These little Tulips should be grown on a sunny ledge in a rock garden or else in pots in an alpine house. They are almost too insignificant for cultivation in the open border. The next species to flower, however, is a plant of real garden merit, namely, *T. Kaufmanniana*, a Turkestan species which is very variable in its colour and a very easy plant to grow. It has, moreover, the remarkable habit of forming new bulbs at a depth of several inches below the point at which the original bulb was planted, and if those gardeners who dig up the bulbs of this species are inexperienced they will declare that the bulbs have rotted, and then be surprised to find the leaves and flowers appear as strong as ever in the following year. The explanation will be that they only found the husk of the old bulb and that the new bulb was several inches down in the ground, so that they failed to find it. The reason for this habit is not clear, because it often happens that these bulbs drop down into very poor soil, in which there can hardly be any attraction for them. Moreover, as they are only nourished by the roots and leaves of the original plant, which is presumably planted in good soil,

they are obviously not drawn away by any attraction in the new position.

T. Kaufmanniana has another remarkable character, which it shares with several of the wild species, that is to say, the buds are fully coloured as soon as they become visible. We all know the green buds of Darwin Tulips which grow almost to their full height before they change colour at all; but as soon as the leaves of *T. Kaufmanniana* pierce the soil and begin to unfold the coloured bud can be seen before it is quite above the surface of the ground. When the flowers of the usual type are fully open they are white with a yellow centre, a colouring which somewhat resembles that of our common Water-lily. The three outer petals are coloured on the outer surface. In some cases the colour is scarlet, in others a dull purplish-red; sometimes slate-blue with red tips and sometimes the traces of any colour are very faint. In other specimens the yellow colour of the base spreads over the whole flower with the outer petals coloured in the same way as in the ordinary form.

There are at least two varieties of which the flowers are wholly red. In the variety *coccinea* they are a bright scarlet, and in the variety 'Brilliant,' which was found, I believe, among the bulbs imported by Mr. C. G. VAN TUBERGEN of Haarlem, the colour is of a distinctly pinkish shade of red. This latter variety increases rapidly by offsets; but *coccinea* is in my experience very slow to increase in this way. In fact it must practically always be raised from seed, and this process takes from five to seven years. Fortunately this fine variety comes quite true from seed, and it is curious to notice that when the first seedling leaves appear they are distinctly red, and there is a red edge to the leaves of the mature plant.

The process of raising Tulips from seed is comparatively simple, though I cannot deny that it is tedious. The seeds should be sown in pots of rather loose rich soil in September or October. The pots should be sunk to the rim in the open either in sand or ashes and left exposed to the weather all through the winter. The young seedlings appear in the form of loops about the beginning of February and usually do better then if they are given the shelter of a cold frame. The lights should be removed whenever the weather is favourable, and the young seedlings encouraged to grow as long as they will. When they turn yellow the pots should be kept absolutely dry until October. It is a good plan then to remove the top inch or two of the soil, for the bulbs will be found to have dropped to the bottom of the pots, and to replace this upper layer with fresh soil. The pots should then be plunged in the open once more for the next winter and brought into cold frames again in the spring. During the summer the young bulbs can be sifted out of the pots, and they should then be sown in nursery beds in the open at the end of October. The trials of the raiser are not then over but merely beginning, for these seedling Tulips have a troublesome habit of forming "droppers" or bulbs at a lower level than that at which they were planted. Why

these small bulbs do not devote their energies to producing each a large bulb, which will flower, instead of three or four small bulbs, none of which is big enough to flower, is a mystery. However, there is no known method of preventing the formation of these "droppers," and unless the raiser hardens his heart and throws them away each year he must either lift them carefully and keep each little colony separate until they reach flowering size or be content to have a lot of varieties mixed up together when his bulbs eventually begin to flower. Each seed of a garden Tulip will produce a distinct variety, though all the offsets and "droppers" of each one will, of course, produce identical flowers.

The process of lifting these small bulbs and their "droppers" must be carried out each year as soon as the leaves wither, and the bulbs be kept dry and comparatively warm until the end of October or the beginning of November, when they should be replanted. A few small flowers will probably be obtained in the fifth or sixth year, but it is not until the seventh year from the time that the seeds ripen that full-sized flowers are obtained. There is, however, one species, *T. Sprengeri*, the latest of all to flower, of which the seeds may be sown broadcast among herbaceous plants and of which the seedlings will begin to flower in four years without any further attention. This is due to the fact that *T. Sprengeri* does not flower until the end of May and therefore its leaves appear so late in the spring that they do not often run the risk of being injured by frost.

To return now to the various species of Tulip, it will usually be found that, before *T. Kaufmanniana* has faded, another Turkestan species, *T. Greigii*, will be in flower. This species is easily distinguishable from all others by the fact that its leaves are in many cases conspicuously blotched or striped with dark brown-purple. The flowers are of a particularly handsome shape with the three outer petals tending to reflex. The colour is usually a brilliant scarlet, though it is sometimes replaced by yellow with red markings and there is also a variety in which the ground is white. This species is, unfortunately, comparatively rarely seen now, because Turkestan is in the hands of the Bolsheviks and because the bulbs hardly ever form any offsets. Since it is impossible to import collected bulbs, and since no firm in this country seems to be willing to take up the cultivation of these species, supplies are not available. The same applies to another Turkestan species, *T. Fosteriana*, which is the largest flower of all, for an open flower of *T. Fosteriana* will measure as much as ten inches in diameter. The colour is a brilliant scarlet with a dazzling shiny surface, and the base may be either pure yellow or wholly black or marked with black on a yellow ground. The leaves may be either green or glaucous, so that it is extremely difficult to give an exact definition of this gorgeous species. It increases slowly by offsets which, however, are usually so small that it is two or three years before they flower. Another good species flowering about the same time is *T. Eichleri*, which comes from Armenia and of which

one particular form has increased so rapidly by offsets that it can be obtained in large numbers from its introducer, Mr. C. G. VAN TUBERGEN of Haarlem.

T. praestans should be in every garden. It is easy to grow, it increases by offsets, and since each bulb produces two or three flowers of a peculiar light but brilliant scarlet, which open flat in the sun, a group of them may be relied upon to produce a very telling effect. It has, however, one disadvantage. The leaves are numerous and thick and, combined with the branching stem, make the plant rather top-heavy, so that a gale of wind may snap the stems at the ground level. The bulbs should therefore be planted nearly a foot deep, for this tends to keep the leaves nearer to the ground, and also, I am inclined to believe, the nourishment in the long underground stem helps the bulb to survive even if the growth above ground is snapped off.

T. praestans differs in one respect from all other known species in that the somewhat narrow oblong leaves have a distinct midrib on the under surface, by which they can always be recognised. This leaf is common to the various forms of the species. The earliest to flower is the dwarf form, known as VAN TUBERGEN'S variety, in which the filaments, which support the anthers, are scarlet. In order to confound those botanists who have attempted to divide Tulips into groups according as they have smooth or hairy stems, this form has either a very hairy stem or one which is quite smooth. A slightly later flowering form from another locality in Turkestan grows nearly two feet high, and is distinguished by the fact that the filaments are black. There is also frequently some slight black shading at the base of the inner surface of the flower, which however soon fades and leaves the flower wholly scarlet.

A little later than these species come two more with huge red flowers—*T. ingens*, of which the foliage is conspicuously grey and hoary, and *T. Tubergeniana*, which, from the garden point of view, is surely one of the finest of all the species. Unfortunately, neither increases much except by seeds, and they are not easily obtained.

From a botanical point of view it is extremely difficult to classify Tulips in groups, for there seems to be only one character which is constant, and that is not very obvious to the eye. It is merely the presence of a tuft of hairs at the base of the stamens and sometimes in addition of a few scattered hairs at the edge of the base of the inner segments. None of these big scarlet Tulips from Turkestan have these hairs, but they are present in all forms of *T. biflora* and in our native yellow *T. sylvestris*, which is also common in one form or another all over Western Europe, and which is represented in Greece and Asia Minor by a number of allied species with such names as *T. Orphanidesii*, *T. Hageri*, etc. *T. sylvestris* has nodding, sweet-scented flowers, and usually produces two, or even three, on each stem. *T. Orphanidesii* has flowers of a curious shade of dull terra-cotta, and there are really quite a number of forms of it differing only in the exact shade

of colour, in the time of flowering and in the height of the stem. From Asia Minor come several forms with almost orange-coloured flowers, but to these no names have yet apparently been attached. In Algeria this group is represented by *T. primulina*, of which the open flowers are white though the outer petals are tinged with pale pink and green. This species has the curious habit that the flowers remain closed throughout the hotter part of the day and only open in the late afternoon when all the others have closed, for, as a rule, Tulips are only open in the sun and close as soon as it sets or is obscured.

Another ally is *T. saxatilis* from Crete. The flowers are of an attractive shade of pinkish-mauve with a large yellow base and conspicuous chocolate anthers. Of this Tulip the leaves are, unfortunately, much better known than the flowers. It is quite common in rock gardens to see these broad glistening leaves of dark green which appear year after year but never produce a flower. The bulbs have the further peculiarity that they travel quite a distance by means of runners which push out horizontally through the ground. The only way to get flowers of this species is to grow them in rich soil and to lift them every year and keep them warm ; then, when the stems do appear, each bears two or three flowers, and a good patch of this species is a fine sight.

To the section with the hairy stamens belongs also the dwarf *T. dasystemon*, which flowers in April and of which each bulb produces a clump of two, three or even five or six flowers. The buds are green with purplish shading, but the open flowers are white with a yellow centre. They only rise some three or four inches from the ground ; but, since they will go on from year to year in a warm, dry situation, they are well worth planting in a sunny corner of a rock garden.

Another little group of species, of which the flowers are, if anything, more brilliant than those of any others, consists of *T. linifolia*, *T. Maximowiczii*, and *T. Batalini*. These species come from the mountains of Northern Persia and the countries to the east, and it was, I believe, one of them which received the name of *T. montana* when it was grown by Dr. LINDLEY in the Society's old garden at Chiswick. No herbarium specimen of LINDLEY's plant remains, and the description is so inadequate that it is impossible to determine the question with any certainty. All that is certain is that its plate in the *Botanical Register* does not represent the Tulip of a bright sealing-wax red which is usually obtainable under the name of *montana* and which comes from Syria.

T. linifolia and *T. Maximowiczii* are almost identical when in flower, but the latter is somewhat earlier in making its growth and the leaves are distributed up the stem, while those of *T. linifolia* tend to remain as a rosette on the ground. The flowers of both are of the most brilliant scarlet imaginable, with a glistening surface and a black blotch at the base. *T. Batalini* has been described as a species but is only a soft yellow form of *T. Maximowiczii*. These yellow and the red forms hybridize easily with one another and produce all sorts of intermediate shades, some of a charming apricot.

Fortunately these species increase fairly rapidly by offsets ; but it is advisable to lift them every year, for the outer coats of the bulbs are very hard and the mother bulb and its offsets must have difficulty in separating unless these old husks are removed. Wild bulbs, when collected, are often surrounded by the outer tunics of six or eight previous seasons, and traces can be found of offsets which have failed to develop.

T. Kolpakowskiana is another Turkestan species growing to about nine inches or a foot in height, with two or three narrow leaves, usually with yellow flowers backed with scarlet, though they are sometimes wholly scarlet.

T. Ostrowskiana has scarlet flowers and the curious habit of sending up a stem with a flower bent over like the head of a shepherd's crook. The buds remain pointing downwards until the stem is fully grown, when they turn erect and open.

Rarer than any of these, and somewhat difficult to keep, is *T. Schmidtii* from Armenia, which is peculiar in that it forms a tuft of ten or a dozen leaves round the sturdy stem, which bears a large scarlet flower ; the bulbs seldom if ever make offsets, and appear, like those of *T. Sprengeri*, to die out after flowering for a few years. Another rare species is *T. Hoogiana*, with a very woolly bulb and several leaves on a tall stem and a bright scarlet flower with a black blotch. This is later than, but somewhat similar to, a Tulip which is often found in gardens under the name of *T. praecox*, which is one of the earliest to flower, though it is not, I believe, a wild species. The stem is of a curious purplish colour, and the bulb has the habit of forming small bulbs at a distance of several inches or even a foot away, so that its offsets often get mixed up with other plants and appear in unexpected places. The somewhat large bulbs have very woolly skins, and the plant needs a sheltered position, since it is one of the earliest to flower. It has probably been derived from one of the Syrian Tulips, which seem to have at present no botanical name, for they have no right to that of *T. montana* under which they are usually grown.

Many years ago I set out to grow the Tulip species in the hope of discovering the origin of our garden Tulips ; but I must confess that so far I am entirely baffled by the problem. The nearest approach among the wild Tulips to any of our garden hybrids is to be found in the yellow and the red Tulips introduced from Armenia under the names of *T. armena* and *T. galathea*, and in a yellow Tulip which grows only at one point in Hungary and which has been described under the name of *T. hungarica*. It is possible, of course, that when the Turks grew Tulips in large numbers in Constantinople several centuries ago they used as the parents the Tulips of some valley or valleys in Asia Minor, from which the wild bulbs were entirely exhausted. The early dwarf 'Van Thol' varieties may come from plants found on the Steppes of Russia, but, as far as I can discover, there are no wild species at present in cultivation of which it could be said without any doubt that they are the parents of our garden plants.

SOME FURTHER NOTES ON THE CONTROL OF SLUGS.

By W. E. H. HODSON, A.R.C.S., D.I.C.

SINCE the appearance of an article on slug control in a previous issue of this JOURNAL (vol. 49, Part 2, 1924), the writer has had the opportunity to conduct some further experiments.

These experiments have been carried out on a more extensive scale than was previously possible. In view of this fact, and also owing to the large number of queries that have been received as a result of the previous article, it was felt that a few further notes on the subject would be of use.

The aluminium sulphate and lime formula previously advocated has been tried, both by the writer and other investigators. It has proved highly efficient in many cases in which full data have been obtainable. Some failures reported have on investigation proved to be due to the fact that the application has been made at unsuitable times: in some cases after heavy rains, when the ground being in a sodden condition has resulted in an undue dilution of the mixture, and in others during a period of drought, when the slugs were in a state of quiescence below ground.

It has been found further that powdered aluminium sulphate mixed with twice its weight of lime and broadcast at the rate of about $\frac{1}{2}$ cwt. of the mixture to the acre gives a very efficient control. On some treated plots a 70 per cent. to 80 per cent. kill of slugs was registered, and an acre of young cabbage so treated showed a very marked improvement on the untreated control portion, the individual plants being very much more vigorous and the number of misses very considerably less. The difference in the two areas was apparent right up to marketing time.

This method, however, while excellent for seed-beds, borders, and the like, is hardly practicable on a large scale, firstly owing to the comparatively high cost of the sulphate, and secondly to the liability of the powder to scorch delicate foliage if carelessly applied.

It was therefore decided to try the application of a poison bait, on a larger scale than had hitherto been attempted against slugs. The bait which gave the most promise of success appeared to be that advocated by FRYER and STENTON (*Ann. App. Biol.*, vol. x., No. 2, 1923), and since used by the writer and others with success against surface caterpillars (*Agrotis* spp.).

The first trial was conducted on a large rock garden. This was suffering severe depredations from both slugs and snails. The bait, consisting of bran 10 parts and Paris green 1 part, was mixed and broadcast by hand on a muggy evening on which the slugs were observed to be active. By the following morning immense numbers of dead slugs

and snails were to be found, and it was noted further that numerous wood-lice had met with a like fate. Damage to the plants practically ceased after the application, and very few living slugs could be found. A further quantity of the poison was applied a week later, and the bulk of those remaining were accounted for.

In view of the success of this treatment it was decided to try the bait on a larger scale, and a field of young cabbage, about an acre in extent, was selected for the purpose. The cabbages were being very badly slugged previous to the application, but afterwards nearly all damage ceased, and a careful examination disclosed large numbers of dead slugs.

Numerous further applications on similar lines show, without doubt, the efficiency of this mode of control.

It was felt that in view of the poisonous nature of the Paris green it would be desirable to use as small a quantity as was likely to be reasonably efficient. In later experiments therefore the proportion of bran was increased: 1 lb. Paris green to 20 lb. bran was the proportion finally decided upon, 20 to 40 lb. of the mixture being used to each acre of ground treated.

Used at this strength there seems little fear that any birds would be likely to obtain a sufficient quantity of the poison to injure themselves. The possibility of this occurring should be borne in mind when using this method however, and poultry should not be allowed access to the area for some few days after the application has been made.

The method of making up the bait is exceedingly simple. The bran and Paris green in the proportions indicated above, viz. 20 to 1, are thoroughly mixed together dry. The mixture is then moistened, water being added in a sufficient quantity just to damp the bran, but not enough to cause the flakes to adhere together. A little sugar added to the water appears to make the bait a trifle more attractive. Broadcasting is best carried out by hand, a thin, even distribution over the whole area being aimed at; 20 to 30 lb. is the most advantageous quantity to use to the acre on a field scale, a trifle thicker on gardens or allotment areas, but the possibility of danger to livestock in the event of spreading too thickly must be borne in mind. A second application a week after the first will be found to give the best control results, and, as the cost is negligible, there seems no reason why periodic applications should not be resorted to if necessary.

To summarize very briefly. While a contact poison, namely, aluminium sulphate and lime, has been found to be an excellent control measure to adopt against slugs—in particular when the area to be treated is small—its use on a large scale is hardly practicable, firstly on grounds of expense, and secondly owing to the difficulty of application over large areas at a suitable time. A poison bait, namely, bran and Paris green, lends itself admirably to use in the latter circumstances, being both cheap and easy to apply.

Whichever method of control is being adopted, a point of paramount importance is the knowledge of the most suitable time to make

the application. Our knowledge of the slug's habits must therefore be taken into account.

If the surface of the ground is dry the slug will remain under cover at the base of the plants. Alternatively, if too wet, no poison, unless put on in a very concentrated form, can be effectual.

The ideal time for application is after a shower on a fairly warm evening. As is well known, the slug usually becomes active at dusk, and after a few days' rest owing to adverse weather conditions will be most likely to expose itself to a contact poison or to feed on the poison bait.

The selective feeding habits discussed in the last article probably account for the success of the poison bait as a method of control. The slug is at all times partial to a bran meal, and the opportunity of varying the usual diet seems to be the explanation of the high percentage of slugs killed when this method is employed.

THE AWARD OF GARDEN MERIT.—VI.*

38. NARCISSUS CYCLAMINEUS.

Award of Garden Merit, March 9, 1925.

EVERYONE knows and admires the Daffodils, but few know that besides the wild progenitors of the flowers that make so much of our exhibitions in spring, and that grace so many of our gardens and our tables in the early part of the year, there are some small wild species well worth growing. *Narcissus cyclamineus* is one of them, and it differs in form from the common Daffodil mainly in having the rather narrow pieces of the perianth bent right back like the petals of a cyclamen. Both the long straight trumpet and the perianth are bright yellow, and the two together measure about two inches. Though they are pleasant to see singly it is when growing in sheets in open woodland that their beauty is most appreciated. So they may be seen in the wood at Wisley, spread now into many places, and the first things in spring, after the mosses from which they emerge, to brighten it. The first flowers open as a rule in the last week in January, and the flowering goes on (unless the weather be very hot) until nearly the middle of April. The soil there is moist and almost entirely of vegetable origin—decayed leaves of oaks and birches, and the mosses of hundreds of years accumulated and (where the Narcissi are growing best) almost undisturbed. Some flowers may be had from purchased bulbs (they are collected from wild sources for sale), but the best results are to be obtained from seedlings raised where they are to flower, and raised best by sowing the seed as soon as ripe on moss in open woodland, letting it lie undisturbed. It germinates at the time the older plants commence growth and the seedlings take three or four years to attain flowering size. Cool moist (not stiff wet) soil, semi-shade, and the shelter of overhead branches, and peace—these are the requirements of *Narcissus cyclamineus*, and in return it will delight by its brightness and add to that atmosphere of peacefulness without which no garden can give the fullest refreshment to the spirit of man. *N. cyclamineus* has given some pleasing hybrids with other species, and occasionally one appears in the Wisley wood.

39. IRIS RETICULATA.

Award of Garden Merit, March 9, 1925.

This is a plant for the sun, not shade; for well-drained soil, sweet and not too rich in vegetable matter, nor too light. Given this and the

* For earlier annotated lists of Awards of Garden Merit see vol. 47, p. 189; 48, pp. 58 and 223; 49, p. 233; and this vol., p. 100.

opportunity for the leaves to live as long as they will it is not likely to fail (unless the bulbs have contracted the fungus disease to which these plants are prone and that will quickly destroy them) to flower in February or March, and probably to increase. The deep blue form known as typical *reticulata* is the form to which this award applies, but the group of Irises of which it is a member, characterized by the beautifully netted bulb tunic, is one containing many forms such as the allied and reddish *Krelagei*, which is often offered for sale, as well as other seedling forms and allied species.

40. *LEUCOJUM VERNUM CARPATHICUM*.

Award of Garden Merit, March 9, 1925.

The Leucojums, or Snowflakes, are closely related to the Snowdrops, but have all their floral segments alike (and green or yellow tipped), are more sturdy looking and less white than the Snowdrops, but are yet very pleasing in the early spring. They are not very particular as to soil, but do not flourish in peat at Wisley, seeming rather to favour the more loamy soil where, among other plants, they have naturalized themselves. The best form of the spring Snowflake is the variety *Vagneri*, which Wisley owes to the kindness of Mr. Fletcher, of Aldwick Manor, Bognor, but that is an uncommon plant. The award has been given, therefore, to the variety *carpathicum*, less vigorous perhaps than *Vagneri*, and with yellow, not green, tips to the perianth segments, but producing two flowers from strong bulbs, not one as in typical *L. vernum*. Two other species are worth growing in our gardens, coming later into flower and, like this, quite hardy, but, unlike this, doing best in wet spots, *L. Hernandezii* (= *L. pulchellum*) and *L. aestivum*.

41. *CHIONODOXA SARDENSIS*.

Award of Garden Merit, March 9, 1925.

The Scillas and the Chionodoxas are nearly related, so nearly that there is intercrossing between species of the two genera and especially between *Scilla bifolia* and Chionodoxas. The botanical relationships are such that the garden characteristics and requirements of the plants are also similar. Two or three rather narrow linear leaves spring from the ground in early spring and at first arch over and protect the young inflorescence of blue flowers on its way from the bulb to open in the March winds, which they treat almost with scorn. Ordinary good soil suits them, and they are excellent in the shade of deciduous trees. Acres of this species (*C. sardensis*) flower under apple trees in some of the large nurseries in the Wisbech district, and they produce a picture worth going far to see—the clean boles of the apples rising straight and dark out of a sea of blue—so I saw them in mid-March, so they may be seen in mid-March in any year, and the picture may be reproduced in any garden if sufficient breadths are planted. At

Wisley *C. sardensis* seeds freely and has naturalized itself in several parts of the garden, where the shade is not too dense. It seems the most persistent of the genus, and is known by its clear blue colour from the nearly allied *C. Luciliae* (which has a white eye).

42. HELLEBORUS ORIENTALIS.

Award of Garden Merit, April 6, 1925.

Except the "Christmas Rose," Hellebores are little known and little grown, yet many of them are beautiful herbaceous plants both in foliage and flower, and the "Lenten Roses," of which *Helleborus orientalis* may be taken as the typical example, are especially useful since they flower so early, being at their best from February to April. The leathery deep green leaves with seven to nine serrate leaflets, from among which rise, to a height of 12 to 18 inches, the large flowers, six or so on a stalk, rather nodding it is true, and needing to be looked at closely to appreciate their full beauty, make a plant of distinction. The colours are mostly soft tones of pink, purple, and grey, and in some varieties the surface of the sepals is more or less chequered or spotted. Many named varieties are offered and from among them various coloured forms may be chosen, and the species has been crossed with others, giving rise to some very pleasing hybrids. These named forms may be increased by division if the plants are strong, but as time passes they often seem to lose something of their youthful vigour and to give less good results if division be persisted in. It is therefore wise to raise seedlings, and, unless colour schemes are in question, these may be depended upon to give pleasure if planted in semi-shade, grown in good loam enriched by well-decayed farmyard manure, and annually top dressed after flowering. The seed should be sown as soon as ripe.

WALLFLOWERS TRIED AT WISLEY, 1923-24.

THE seed of the Wallflowers received for this trial was all sown outdoors on June 1, 1923. As soon as large enough the plants were transplanted into nursery beds, and then into their flowering quarters during the first week of October.

One hundred and sixty-two stocks in all were sown. Of these one was *Cheiranthus Allionii*, a good stock of which was sent by Messrs. R. Veitch, and which was Highly Commended. Two were of "Annual" type, flowering quickly from seed (in September) and proving very tender, all in fact dying during the winter. The season was a trying one on the whole and many plants suffered considerably, although eventually at the end of April and in May the flowering was good. The stocks generally, however, were not of really first-class quality, too much variation in size of flower being evident in most of them, while, in some, variation in habit and shade of flower was to be seen. The awards made were none of them higher than Highly Commended, and this is largely due to inequalities in the stocks, although partly to the fact that the development of the plants had been interfered with by the weather.

Some varieties seem less hardy than others, and this is a point to which raisers might well pay attention, for a Wallflower which will not withstand the vagaries of our English winter is not likely to be of much value in this country.

Twenty-three stocks were sent in as double-flowered.

In the following descriptive notes an attempt has been made to group together varieties most alike under their colours, dealing with the single-flowered forms first.

AWARDS, DESCRIPTIONS, AND NOTES.

A. Single Varieties.

1. *Flowers white.*

AWARDS.

White Dame, H.C. May 14, 1924. Introduced by Messrs. Hurst and sent by Messrs. R. Veitch of Exeter and Messrs. Barr of Covent Garden, W.C.

White Gem, H.C. May 14, 1924. Sent by Messrs. Dobbie of Edinburgh.

Linnaeus, H.C. May 14, 1924. Sent by Messrs. Barr.

Ivory White, H.C. May 14, 1924. Introduced by Messrs. Hurst and sent by Messrs. Barr.

WHITE DAME (R. Veitch, Barr), **H.C.**—8 to 12 inches; flowers cream, fading to creamy-white.

* * *

WHITE GEM (Dobbie), **H.C.**—A taller form of 'White Dame.' 14 to 16 inches. Stock not quite true.

LINNAEUS (Barr), **H.C.**—Like 'White Gem.'

IVORY WHITE (Barr), **H.C.**—Like 'White Gem.'

2. *Flowers primrose.*

AWARD.

Primrose Dame, H.C. May 14, 1924. Introduced by Messrs. Hurst and sent by Messrs. F. Dicks of Manchester and Messrs. Cullen of Witham, Essex.

PRIMROSE DAME (F. Dicks, Cullen), **H.C.**—16 to 18 inches. Flowers pale primrose. April 28.

PRIMROSE DAME (Barr, R. Veitch).—Less good stocks.

* * *

PRIMROSE MONARCH (Barr, Dobbie, Watkins & Simpson, W. H. Simpson).—A taller form of 'Primrose Dame.' 18 to 24 inches. April 30. The first stock not quite true.

TALL PRIMROSE (Carter).—Similar to 'Primrose Dame.'

3. *Flowers golden-yellow.*

AWARDS.

Extra Dwarf Golden, H.C. May 14, 1924. Introduced and sent by Messrs. Barr.

Golden Monarch, H.C. May 14, 1924. Sent by Messrs. Watkins & Simpson of Drury Lane, Covent Garden, W.C. 2.

Tall Golden, H.C. May 14, 1924. Sent by Messrs. J. Carter of Raynes Park, S.W.

Golden Queen, H.C. May 14, 1924. Sent by Messrs. Cullen.

Golden Bedder, H.C. May 14, 1924. Sent by Messrs. Barr.

TOM POUCE (Rivoire).—10 to 12 inches; very compact. Flowers clear bright golden-yellow. May 5.

* * *

EXTRA DWARF GOLDEN (Barr), **H.C.**—15 inches; very compact. Flowers $1\frac{1}{2}$ inch diameter; clear bright golden-yellow. May 1.

TOM THUMB GOLDEN (Watkins & Simpson).—Characters as for last.

* * *

GOLDEN MASCOTT (R. Veitch, Watkins & Simpson, Daniels, Barr).—14 to 16 inches. Flowers 1 inch diameter; clear golden-yellow. March 10. Stock not quite true.

MASCOTTS GOLDEN (Cullen).—Characters as for 'Golden Mascott.' Stock not true.

* * *

GOLDEN MONARCH (Watkins & Simpson), **H.C.**—14 to 16 inches. Flowers $1\frac{1}{4}$ inch diameter; clear bright golden-yellow.

Less good stocks were received from Messrs. W. H. Simpson, Dobbie, and (under the name of 'Canary Bird') from Messrs. Webb.

* * *

GOLDEN BEDDER (Barr), **H.C.**—16 to 18 inches; very compact. Flowers $1\frac{1}{2}$ inch diameter; clear bright golden-yellow.

* * *

TALL GOLDEN (Carter), **H.C.**—18 to 20 inches very compact. Flowers $1\frac{1}{4}$ inch diameter; clear golden-yellow.

* * *

CRAUFORD BEAUTY (R. Veitch, Cullen, Watkins & Simpson, Cooper-Taber, Barr).—2 feet. Flowers $1\frac{1}{4}$ inch diameter; clear bright golden-yellow. The first two stocks were variable in size of flower, the last in colour.

* * *

GOLDEN QUEEN (Cullen), **H.C.**—18 to 20 inches. Flowers $1\frac{1}{8}$ inch diameter; clear golden-yellow.

* * *

GOLDEN VULCAN (Carter).—16 to 18 inches. Flowers $1\frac{1}{4}$ inch diameter; clear bright golden-yellow. Early flowering (March 10). Stock not quite true.

* * *

WINTER BLOOMING GOLDEN-YELLOW (Carter).—18 to 20 inches; habit somewhat loose. Flowers $1\frac{1}{4}$ inch diameter; clear golden-yellow. Early flowering (February 20).

* * *

GOLDEN KING (Barr, Cooper-Taber).—2 feet; habit somewhat loose. Flowers 1 inch diameter; clear bright golden-yellow.

CLOTH OF GOLD (Kelway, Watkins & Simpson, Carter, Dobbie).—Similar to 'Golden King.' The last contained crimson rogues.

BELVOIR CASTLE (R. Veitch, Barr).—20 to 24 inches; habit straggling. Flowers $\frac{3}{4}$ inch diameter; clear bright golden-yellow; buds deep crimson.

GOLDEN GEM (R. Veitch).—18 inches. Flowers $\frac{3}{4}$ inch diameter; pale golden-yellow. August 20, 1923. Annual variety.

4. *Flowers orange-red.*

ORANGE BEDDER (Watkins & Simpson, W. H. Simpson).—18 to 20 inches. Flowers $1\frac{1}{4}$ inch diameter; bright orange, tinged red; mixed in shade.

FIRE KING (Carter, Daniels, F. Dicks, Barr, Watkins & Simpson, R. Veitch, Kelway, Cullen, W. H. Simpson, Dobbie).—Similar to 'Orange Bedder,' but flowers bright orange-scarlet and a fortnight earlier (April 24). Stocks variable in shade.

Received as 'Fire Ball' from Messrs. Webb and as 'Vesuvius' from Messrs. R. Veitch.

5. *Flowers pinkish-chamois.*

EASTERN QUEEN (Dobbie, Cooper-Taber, Watkins & Simpson, W. H. Simpson, R. Veitch, Webb).—16 inches. Flowers $1\frac{1}{8}$ inch diameter; salmon-red in bud, changing to pinkish-chamois. April 24. Stocks variable in shade.

A stock from Messrs. Carter, received as 'Eastern Queen reselected,' was true.

ROSE QUEEN (Cooper-Taber).—Similar to 'Eastern Queen,' but flowers terra-cotta-pink, changing to pinkish-chamois.

Received as 'Eastern Queen' from Messrs. Barr.

6. *Flowers ruby.*

AWARD.

Ellen Willmott, H.C. May 14, 1924. Sent by Messrs. Watkins & Simpson.

DWARF RUBY GEM (Barr).—14 to 16 inches; habit very compact. Flowers $1\frac{1}{2}$ to $1\frac{3}{8}$ inch diameter; bright ruby-red. Rather late (May 7). Stock not quite true.

Received as 'Tom Thumb Ruby Gem' from Messrs. Watkins & Simpson.

TRIUMPH (Barr, Rivoire).—2 feet. Flowers $1\frac{3}{8}$ inch diameter; bright ruby-red. Stocks mixed.

RUBY QUEEN (Cullen).—Much like 'Triumph.'

ELLEN WILLMOTT (Watkins & Simpson), H.C.—20 to 22 inches. Flowers $1\frac{3}{8}$ inch diameter; bright ruby-red.

Less true stocks were received from Messrs. Daniels, F. Dicks, Barr, W. H. Simpson and one from Messrs. Carter under the name of 'Winter Blooming Deep Red.'

RUBY GEM (Cooper-Taber, R. Veitch, Watkins & Simpson, Barr, Dobbie).—20 to 24 inches. Flowers $1\frac{3}{8}$ inch diameter; ruby-purple. Stocks not quite true.

PURPLE (Cooper-Taber, Barr).—18 to 24 inches. Flowers $1\frac{1}{2}$ inch diameter; reddish-purple. April 30. Stocks not true.

7. *Flowers chestnut.*

AWARD.

Harbinger, H.C. May 14, 1924. Sent by Messrs. Barr and Messrs. F. Dicks.

FELTHAM EARLY (Watkins & Simpson).—2 feet. Flowers $1\frac{1}{2}$ to $1\frac{3}{8}$ inch diameter; bright chestnut. Fairly early (April 18). Variable in shade.

MAMMOTH (Watkins & Simpson, Barr).—2 feet; habit loose. Flowers $1\frac{1}{2}$ inch diameter; bright chestnut. April 18. Stocks not quite true.

* * *

BRONZE KING (Barr, R. Veitch).—24 to 26 inches; habit trailing. Flowers $1\frac{1}{4}$ inch diameter; bright chestnut. April 17. No. 69 a mixed stock. No. 70 did not survive the winter.

* * *

LA NÉGRESSE (Rivoire).—20 to 24 inches. Flowers $1\frac{3}{8}$ inch diameter; chestnut. April 18. Stock not quite true.

* * *

RUPERT (Barr).—15 to 20 inches. Flowers $1\frac{1}{4}$ to $1\frac{1}{2}$ inch diameter; bright deep chestnut. Stock mixed.

* * *

HARBINGER (Barr, F. Dicks), H.C.—22 to 24 inches; habit somewhat loose. Flowers $1\frac{3}{8}$ inch diameter; deep chestnut.

A variable stock, received also from Messrs. Barr as 'Feltham Early Dark.' An untrue stock of Nos. 72, 73.

* * *

PHOENIX (Barr).—Characters as for 'Harbinger,' but flowers $1\frac{1}{2}$ to $1\frac{3}{8}$ inch diameter. April 17. Variable in shade.

* * *

TOM THUMB BLACK BROWN (Watkins & Simpson, R. Veitch).—16 inches; habit very compact. Flowers $1\frac{1}{2}$ inch diameter; deep chestnut. May 5. Variable in shade. Taller rogues.

8. Flowers crimson shades.

AWARDS.

Royal Purple, H.C. May 14, 1924. Raised and sent by Messrs. Rivoire of Lyon, France.

Goliath, H.C. May 14, 1924. Sent by Messrs. Barr and Messrs. Heinemann of Erfurt, Germany.

Vulcan, H.C. May 14, 1924. Sent by Messrs. Watkins & Simpson and Mr. J. Fitzpatrick of Ashton-under-Lyne.

Dresden, H.C. May 14, 1924. Sent by Messrs. Barr.

Blood Red, Kershaw's, H.C. May 14, 1924. Sent by Messrs. F. Dicks.

Blood Red selected, H.C. May 14, 1924. Sent by Messrs. J. Carter.

VULCAN (Dobbie).—12 to 14 inches; habit very compact. Flowers $1\frac{3}{8}$ to $1\frac{1}{2}$ inch diameter; bright crimson. May 7. Variable in shade.

EXTRA DWARF BLOOD RED (Barr).—Characters as for 'Vulcan.' Variable in shade.

DWARF VULCAN (Barr).—Characters as for 'Vulcan,' but flowers $1\frac{1}{2}$ inch diameter. April 10.

TOM THUMB VULCAN (Watkins & Simpson).—Characters as for 'Dwarf Vulcan.'

* * *

ROYAL PURPLE (Rivoire), H.C.—18 inches; habit very compact. Flowers $1\frac{5}{8}$ to $1\frac{1}{4}$ inch diameter; bright deep crimson. May 5.

GOLIATH (Barr, Heinemann), H.C.—Characters as for 'Royal Purple.' April 30.

* * *

VULCAN (Watkins & Simpson, Fitzpatrick), H.C.—18 to 20 inches. Flowers $1\frac{1}{2}$ inch diameter; bright deep crimson. May 7.

VULCAN (W. H. Simpson, Cullen, Cooper-Taber, Webb, F. Dicks, J. W. Scarlett).—Less good stocks of last.

MATCHLESS (Finney).—Of 'Vulcan' type. Variable in shade.

* * *

DRESDEN (Barr), H.C.—24 inches; habit somewhat compact. Flowers $1\frac{1}{2}$ inch diameter; bright deep crimson. April 30.

RED EMPEROR (Barr).—Characters as for 'Dresden,' but flowers bright deep chestnut tinged crimson. April 5.

* * *

BLOOD RED, KERSHAW'S (F. Dicks), H.C.—2 feet. Flowers $1\frac{1}{2}$ inch diameter; blood red. April 23.

BRILLIANT BLOOD RED (Barr).—A variable stock of last.

* * *

BLOOD RED (Watkins & Simpson, Cooper-Taber, Cullen, R. Veitch).—24 to 26 inches; habit straggling. Flowers $1\frac{1}{2}$ inch diameter; bright deep crimson. April 30. Stocks variable in shade.

* * *

BLOOD RED SELECTED (Carter), H.C.—Of 'Blood Red' type, but flowers $1\frac{3}{8}$ inch diameter and habit compact.

KINVER FAVOURITE (Webb).—Characters as for last, but habit straggling.

BLOOD RED (Dobbie).—Of 'Blood Red' type, but flowers $1\frac{1}{2}$ to $1\frac{5}{8}$ inch diameter. Variable in shade.

GOLIATH (Clucas).—Characters as for last. Variable in shade.

BLOOD RED SELECTED (Daniels).—Of 'Blood Red' type, but variable in shade and size of flower.

GIANT BLOOD RED (Carter). Of 'Blood Red' type, but variable in height and size of flower. Contained rogues.

BLOOD RED, ANNUAL (R. Veitch).—Of 'Blood Red' type. April 30. Not "annual."

* * *

BERLIN FORCING (Barr).—22 to 24 inches. Flowers $1\frac{1}{2}$ inch diameter; bright deep crimson. April 30. A mixed stock.

* * *

ARAB CHIEF (Barr).—A mixed stock.

* * *

BLACK WARRIOR (Cooper-Taber).—2 feet; habit somewhat loose. Flowers $1\frac{3}{8}$ inch diameter; crimson-maroon. May 5. Stock not true.

9. Mixed colours.

UNIVERSAL MIXED (Webb).—20 inches. Flowers $1\frac{1}{4}$ to $1\frac{1}{2}$ inch diameter; mixed colours. April 28.

10. Annual varieties.

EARLY PARIS MARKET (R. Veitch).—18 inches. Flowers $\frac{3}{4}$ inch diameter; pale golden-yellow, reverse brownish. September 5, 1923.

* * *

EARLY PARISIAN, ANNUAL (Barr).—18 inches. Flowers $\frac{3}{4}$ inch diameter; mixed colours. September 10, 1923.

B. Double Varieties.

1. Flowers pale primrose.

DOUBLE DWARF BRANCHING CREAMY-WHITE (Barr).—8 to 10 inches; branching, very compact. Flowers pale primrose fading to cream. May 5.

* * *

DWARF DOUBLE TREE CREAMY-WHITE (Barr).—The less branching counterpart of last. Stock not true.

* * *

DOUBLE TALL BRANCHING CREAMY-WHITE (Barr).—12 to 14 inches; branching. Flowers pale primrose fading to cream. May 5. Stock not true.

* * *

DOUBLE TALL TREE CREAMY-WHITE (Barr).—The non-branching counterpart of last. Stock not true.

2. Flowers golden-yellow.

DWARF DOUBLE BRANCHING CANARY-YELLOW (Barr).—12 to 14 inches; branching. Flowers deep golden-yellow. May 5. Single-flowered rogues.

* * *

DWARF DOUBLE TREE CANARY-YELLOW (Barr).—Dwarfer, 9 inches; non-branching counterpart of last. Single-flowered rogues.

* * *

DOUBLE TALL BRANCHING CANARY-YELLOW (Barr).—Much like the dwarf canary-yellow, but 12 to 16 inches tall. Stock not true.

* * *

DOUBLE TALL TREE CANARY-YELLOW (Barr).—Non-branching counter-part of last. Stock not true.

3. *Flowers bronze.*

DWARF DOUBLE BRANCHING GOLDEN-YELLOW (Barr).—10 to 12 inches; branching. Flowers bronze. May 5. Stock not true.

* * *

DWARF DOUBLE TREE GOLDEN-YELLOW (Barr).—Non-branching counter-part of last. Stock not true.

* * *

TALL DOUBLE BRANCHING GOLDEN-YELLOW (Barr).—18 to 20 inches; branching. Flowers bronze. May 5. Variable in shade.

* * *

DOUBLE TALL TREE GOLDEN-YELLOW (Barr).—Non-branching counter-part of last. Variable in shade.

4. *Flowers violet-purple.*

DWARF BRANCHING VIOLET (Barr).—12 to 18 inches; very compact, branching. Flowers violet-purple. May 8.

* * *

DWARF DOUBLE TREE BLUE (Barr).—Dwarfer, 10 to 12 inches; non-branching counterpart of last. Stock not quite true.

* * *

DOUBLE TALL BRANCHING VIOLET (Barr).—20 inches; branching. Flowers violet-purple. May 4. Stock not true.

* * *

DOUBLE TALL TREE VIOLET (Barr).—Non-branching counterpart of last. A mixed stock.

5. *Flowers chestnut.*

DWARF DOUBLE BRANCHING DEEP BROWN-RED (Barr).—14 to 16 inches; very compact, branching. Flowers bright chestnut. May 5. Stock not true.

* * *

DWARF DOUBLE TREE DARK BROWN (Barr).—Dwarfer, 12 inches; non-branching counterpart of last. Stock not quite true.

* * *

TALL DOUBLE BROWN (Kelway).—18 to 20 inches; branching. Flowers deep chestnut-brown. May 5. Stock not true.

* * *

DOUBLE TALL TREE DARK BROWN (Barr).—Non-branching counterpart of last. Single-flowered rogue.

* * *

DOUBLE TALL BRANCHING DEEP BROWN-RED (Barr).—16 to 18 inches, branching. Flowers bright chestnut-brown. May 5.

* * *

DOUBLE TALL TREE BLACKISH-BROWN (Barr).—20 to 24 inches; not branching. Flowers deep chestnut-brown. May 5.

6. *Flowers mixed colours.*

DOUBLE MIXED (W. H. Simpson).—24 to 30 inches; not branching. Flowers of mixed colours. April 30.

ENDIVES AT WISLEY, 1924.

THE fifty stocks of Endive received for trial at Wisley were sown on July 25 on ground dug and manured after winter lettuce. The rows were 18 inches apart and the plants were singled to 15 inches apart on August 22. Part of each stock was removed to a greenhouse for blanching, part was blanched by means of pots, and part by covering with bracken outdoors. Those put into the house on October 20 and covered for blanching on October 25 were ready for cutting from November 6 to November 14 according to the variety. Those left outdoors to blanch were a week or ten days later in the corresponding varieties.

Most of the stocks sent were true and regular, faults in this respect being noticed below. The Committee judged the varieties from what was seen both under glass and in the open on two or three occasions.

Endive forms a very useful succession to lettuces as a salad for autumn, and it is strange that it is cultivated so little in this country. It is far more grown and appreciated in France; and there is no climatic reason for this.

The two great divisions of the Endives depend upon the nature of the foliage—whether divided or not, and the undivided are usually considered the hardest of them, but as will be seen below there is on the whole little to choose. Some difference in season is found, some requiring longer to blanch than others, some in colour, but the paler varieties have no advantage over the deeper coloured ones in appearance when blanched and ready for the table.

AWARDS, DESCRIPTIONS AND NOTES.

A. LEAVES ENTIRE.

AWARDS.

- Batavian Hardy Green Winter, H.C. November 6, 1924. Sent by Messrs. Barr of King Street, Covent Garden, W.C.
- Broad-Leaved Batavian, H.C. November 6, 1924. Sent by Messrs. W. A. Burpee of Philadelphia, U.S.A.
- Batavian Green, H.C. November 6, 1924. Sent by Messrs. Nutting of Southwark Street, S.E.

1. *Foliage medium yellowish-green.*

BATAVIAN WHITE (Nutting).—Plant large, dense and compact; midrib broad, fleshy, tender; foliage when blanched creamy-yellow, crisp and tender; heads flat. Damaged by weather but stood fairly well.

BATAVIAN GOLDEN HEART (Barr).

ROUND-LEAVED BATAVIAN IMPROVED (R. Veitch). }—Similar to foregoing.

2. *Foliage medium green.*

BATAVIAN GREEN LETTUCE-LEAVED (Barr).—Plant large, dense and compact; midrib broad, fleshy, tender, broadly winged; foliage cream when blanched, crisp and tender; heads conical. Damaged by weather. Stock variable.

* * *

GIANT AUTUMN BATAVIAN (Cooper-Taber).—Characters as 'Batavian Green Lettuce-Leaved,' but head leaves less incurved and creamy-yellow when blanched. Stood well.

3. *Foliage medium dark green.*

BATAVIAN GREEN (Nutting). } H.C.—Plant large, dense and compact; midrib broad, fleshy; foliage when blanched yellowish, crisp and tender heads flattish, firm and compact. A good even stock. Stood well.

BATAVIAN (Cullen).—A less regular stock of 'Batavian Green.'

BATAVIAN BROAD-LEAVED (R. Veitch).—An irregular stock of 'Batavian Green.'

IMPERIAL GREEN BATAVIAN (Dobbie).—A less good stock of 'Batavian Green.'

OVAL-LEAVED (Carter).—A less regular stock of 'Batavian Green.'

4. *Foliage dark green.*

BATAVIAN HARDY GREEN WINTER (Barr), H.C.—Plant large, compact; head leaves fold in like cabbage; midrib broad, fleshy and tender; foliage when blanched yellowish, crisp and tender; heads firm, conical. Good even stock. Stood fairly well.

BATAVIAN IMPERIAL GREEN (Barr).—Like last but less regular.

B. LEAVES DIVIDED.

AWARDS.

Queen of the Winter, } H.C. November 6, 1924. { Sent by Messrs. Barr.
Emerald Gem, } Sent by Messrs. Webb of
Stourbridge.

Ruffec, H.C. November 6, 1924. Sent by Messrs. Cullen of Witham.

Olivet Curled, H.C. November 6, 1924. Sent by Messrs. Barr.

Staghorn, H.C. November 6, 1924. Sent by Messrs. Barr.

Longstanding,

Longstanding Carmes, } H.C. November 6, 1924. { Introduced and sent by
Messrs. R. Veitch of Exeter.
Raised by Messrs. Vilmorin
and sent by Messrs. Barr.

Pancallier, C. November 6, 1924. Sent by Messrs. Barr.

Louviers, } C. November 6, 1924. Sent by Messrs. Barr.
Paris Market,

1. *Foliage medium green.*

QUEEN OF THE WINTER (Barr), } H.C.—Plant very large, of loose habit;
EMERALD GEM (Webb), } leaves broadly lobed; midrib broad, fleshy; when blanched creamy-yellow, crisp and tender; heads loose. Not damaged by weather.

2. *Foliage medium dark green.*

RUFFEC (Cullen), H.C.—Plant large, compact and dense; leaves much and finely cut; midrib of medium width, fleshy and tender; leaves creamy-white when blanched, crisp and tender. Damaged by weather.

* * *

OLIVET CURLED (Barr), H.C.—Characters as 'Ruffec' but plant of more compact habit and leaves creamy-green when blanched. Much damaged by weather.

* * *

PANCALIER (Barr), C.—Very similar to 'Ruffec' but less compact and leaves coarser divided. Much damaged by weather. Stock not quite so regular as the last two.

3. *Foliage dark dull greyish-green.*

STAGHORN (Barr), H.C.—Plant of medium size, very compact and dense; leaves much finely cut; midrib narrow, furrowed, white; when blanched creamy-white, crisp and tender. Slightly damaged by weather. A good even stock.

BORDEAUX CURLED (Barr).—Of 'Staghorn' type but taller and not so compact, with broader tips of the outer leaves. Much damaged by weather.

MODEL (Carter).—Of 'Staghorn' type but less compact and leaves more coarsely divided. Much damaged by weather. Stock not quite true.

* * *

LOUVIERS (Barr),
PARIS MARKET (Barr), } C.—Of 'Staghorn' type but plants smaller, fuller and more compact; the leaves more finely divided. Stood very well. Distinct from 'Paris Market' sent by Messrs. A. Dickson.

4. *Foliage dark green.*

LONGSTANDING (R. Veitch),
LONGSTANDING CARMES (Barr), } H.C.—Plant of medium size, compact and dense; leaves finely cut, more or less crested; midrib of medium width, creamy-white. Cream when blanched, crisp and tender. Stood well.

C. LEAVES DIVIDED AND CRESTED.

AWARDS.

Summer Curled, A.M. November 6, 1924. Introduced and sent by Messrs. R. Veitch.

Early Parisian Summer, A.M. November 6, 1924. Introduced and sent by Messrs. Barr.

Green Curled Winter, A.M. November 6, 1924. Introduced and sent by Messrs. R. Veitch.

White Curled, H.C. November 6, 1924. Sent by Messrs. Burpee and Nutting. [F.C.C. 1878 (Carter, Minier, Veitch, Vilmorin).]

White Heart, H.C. November 6, 1924. Introduced and sent by Messrs. Webb.

Fine Green Curled, C. November 6, 1924. Introduced and sent by Messrs. Webb.

1. *Foliage bright golden green.*

WHITE CURLED (Burpee, Nutting), H.C.—Plant large; habit very loose, prostrate; midrib narrow; leaves finely cut and crested; when blanched creamy-yellow, crisp and tender. Stood very well.

WHITE CURLED (Carter, R. Veitch, Cooper-Taber).—Less regular stocks of the last.

SILVERHEART (Heinemann).

PERFECTION SILVER MOSS CURLED (Barr). } —Like 'White Curled.'

2. *Foliage bright medium green.*

WHITE MOSS CURLED (Nutting).—Plant very small, very compact and dense; midrib very narrow, fleshy; leaves very finely divided, moss-curved, when blanched whitish, crisp and tender. Very much damaged by weather.

* * *

MOSS CURLED (Cullen).—Much like 'White Moss Curled' but less compact and somewhat more finely divided. Very much damaged by weather.

* * *

FRENCH MOSSY CURLED (Carter).—A larger form of 'Moss Curled.' Very much damaged by weather.

3. *Foliage medium dark green.*

FINE GREEN CURLED (Webb), C.—Plant large, very compact; midrib of medium width, whitish; leaves very much finely divided; when blanched creamy-white, crisp and tender. Stood well.

PARIS MARKET (A. Dickson).—Characters as 'Fine Green Curled' but a less regular stock. Distinct from 'Paris Market' sent by Messrs. Barr.

* * *

EARLY PARISIAN SUMMER (Barr), A.M.—Plant of medium size, very compact and dense; midrib of medium width, whitish; leaves much finely divided, moss-curved; when blanched creamy-white. Damaged by weather.

* * *

SUMMER CURLED (R. Veitch), A.M.—Very much like 'Early Parisian Summer' but more compact and midrib much broader and flatter; when blanched cream. Very much damaged by weather. Suitable for growing under glass.

* * *

GOLDEN SUMMER (Barr).—Very much like 'Early Parisian Summer' but less compact and midrib broader; leaves cream when blanched. Damaged by weather.

4. *Foliage dark dull green.*

MOSS CURLED (R. Veitch).—Plant large, compact, habit loose; midrib broad, fleshy; leaves much very finely divided and curled; when blanched creamy-white, crisp. Very much damaged by weather.

* * *

GREEN CURLED WINTER (R. Veitch), A.M.—Characters as 'Moss Curled' but plant more compact, leaves not so finely divided and a narrower midrib; cream when blanched. Very much damaged by frost. A very good even stock.

WHITE HEART (Webb), H.C.—Characters as 'Green Curled Winter.'

GREEN CURLED (Carter, Burpee, Dobbie, R. Veitch).—Characters as 'Green Curled Winter' but less regular stocks.

LARGE GREEN CURLED RUFFEC (Barr).—Too much like 'Green Curled Winter.'

GREEN CURLED RUFFEC (Nutting).—Too much like 'Green Curled Winter.'

EXTRA FINE CURLED (Barr).—Too much like 'Green Curled Winter.'

BOOK REVIEWS.

"Plant Forms and their Evolution in South Africa." By J. W. Bews. 8vo. 199 pp. (Longmans, London, 1925.) 12s. 6d. net.

It is about 150 years since Francis Masson first introduced South African plants into English gardens, many of which have been such a source of pleasure to the lover of flowers and of profit to the hybridist. If the length of time which has passed since then has allowed the present generation to forget what garden lovers owe to South Africa, we need only recall the genera *Gladiolus*, *Moraea*, *Nerine*, *Crinum*, *Clivia*, *Agapanthus*, *Freesia*, *Ixia*, *Haemanthus*, *Buphane*, *Watsonia*, *Montbretia*, *Arctotis*, *Gazania*, *Gerbera*, *Bauhinia*, *Protea*, *Erica*, *Strelitzia*, *Encephalartos*, *Aloe*, *Mesembrianthemum*, *Pelargonium*, *Nemesia*, *Stapelia* and *Streptocarpus*, to mention but a few at random. Page after page of the earlier volumes of the *Botanical Magazine* is graced with figures of treasures which that rich but still too little known flora has yielded, and which we owe to the energy of those indefatigable collectors sent out by Kew in the early days. But when we recall that over forty South African species of *Protea* and an unknown number of *Ericas* have been in cultivation in England at one time or another, one is led to ask what has become of them, and why they are not still with us; certain it is that it has not been for lack of beauty in either form or colour. There must be some other reason, climatic or edaphic, which has baffled the skilled gardener, and if only we knew the conditions of climate and soil under which these plants grow in their native haunts we might be better able to give them satisfactory treatment in cultivation.

We are glad to note that an increasing interest is now being taken in the cultivation of "Cape plants" in this country; on this account, as well as for other reasons, we welcome the timely appearance of this volume. From the horticulturist's point of view, as well as that of the student of plant evolution and distribution, a study of this work should prove both interesting and instructive. Its author has given us a very readable and very interesting account of South African plant forms, illustrated with some thirty-one original figures, and with a good index and bibliography.

The illustrations are largely the handiwork of Miss Stella Gower, a capable plant artist in water-colour, and we could wish that the line drawings had done her more justice. In some cases selection of better specimens for illustration might have produced better results.

Discussing the origin of the South African flora, the author expresses the view that it is largely derived from that of tropical Africa, and that both the tropical and temperate elements are older than the sub-tropical. This is in accord with the conclusions of the present

reviewer submitted in a paper written before Professor Bews' book had appeared, and read before the Linnean Society in February last.

The author quotes from Dr. Marloth's studies of the South-West Cape flora, which seem to indicate that, at the present day, the Karoo flora is aggressive and is tending gradually to invade the region hitherto occupied by the south-western vegetation. "The south-western flora may have occupied a much wider area at one time, and Marloth's observations would support this view." Professor Bews agrees that the latter is an old flora, older than the sub-tropical flora of the Transvaal, Natal and the Eastern Cape Province, though perhaps not older than the tropical African flora.

As to the origin of the genus *Erica*, with some 480 African species, Professor Bews refrains from offering a definite opinion. "While the Ericaceae," he points out, "are common in Europe, Asia, and North and South America, they are almost absent from Australasia, where they are replaced by the nearly allied Epacridaceae. In tropical regions they occur at higher altitudes, but have there, in *Erica arborea*, retained the more ancient tree-growth form, as also in the Asiatic Rhododendrons. The fact that the Australian Epacridaceae (which differ chiefly in the stamens) are ranked as a separate family may possibly indicate that the South African Ericaceae have been evolved since the connexions with Australia—if these ever existed—were broken." The reviewer has elsewhere suggested (*Proceedings Linn. Soc.*, February 19, 1925) that the wide distribution of *Erica arborea* combined with its retention of the more ancient tree-growth form (it is the largest species of the genus) points to its relative primitiveness, and that the centre of dispersal of the genus may be European and North African rather than South African. If this is the case, it is not unlikely that the Ericaceae and Epacridaceae are descendants of a Eurasian stock common to both.

As Bews well says (pp. 37, 38), according to the theory of southward migration from the northern hemisphere, "the primitive ancestors of the whole temperate and south-western flora of Africa came from the north, but they have left few descendants along the track of their invasion because conditions there are not generally suited to them. When they reached more temperate areas in South Africa they multiplied exceedingly and produced many divergent types in the course of their differentiation. The south-western flora is now a very rich and interesting one in consequence, containing an enormous assemblage of endemic forms."

We entirely concur in his view that "it does not follow that the region where a flora is now best represented is necessarily the centre, or nearest to the centre, of its origin."

The author essays, among other things, to throw light on the phylogeny of the seed-plants, from a study of their form and ecological distribution, as supplementary to the evidence afforded by their floral structure. He concludes that "geographical distribution and migration is one of the most useful keys to doubtful questions of

phyletic history," and that "the whole fascinating story can be read most easily in a country like South Africa, where the record has been continuous and uninterrupted for a vast period of time."

He points to conditions in the Cretaceous period, when a warm rain-forest type of vegetation prevailed, and argues that the most primitive types of woody plants were sparingly branched trees with large undivided leaves.

The view that xeromorphic types—thorny plants, succulents, and species showing great reduction of leaf-surface—are derivative rather than primitive has considerable South African evidence to support it. In a study of the vegetation of the Transvaal, the present reviewer has been impressed with the fact that xeromorphic plants—Aloe, Portulacaria, Mesembrianthemum, etc., are found not only in the arid zone, but also in the zone of greatest rainfall (though occupying the driest places in that zone). Such plants, in such situations, are usually spoken of as migrants from more arid areas; but the question arises, Did they not originate in the more humid belt, and migrate from thence into the desert, rather than in the reverse direction? The answer of those who hold the view that the centre of greatest differentiation of a group is also the centre of its dispersal will be that the arid areas (where they are most abundant) are the centre of origin of the xerophytes of a region, and that their occurrence elsewhere is due to migration. Our own view favours that of Bews in this particular: it is difficult to conceive of xerophytes starting *ab initio* in desert areas; that the innate tendency to vary in all parts of plants should lead to the development of xeromorphic forms under mesophytic conditions is a reasonable hypothesis. That such types, once established, should be able to spread into areas where more mesophytic types fail to maintain a foothold, and there to establish themselves, multiplying their own kind and perhaps giving rise to other types, also seems quite reasonable.

Speaking of the very interesting desert types found in the Karoo, the following conclusion is reached as to the effect of semi-desert or desert conditions on the vegetation:

- (1) There is a vast reduction in the number of individual plants;
- (2) There is a reduction also in the number of species;
- (3) The perennials are the most extreme types of xerophyte, usually either thorny or succulent or both;
- (4) There is a high proportion of annuals in the flora, short-lived mesophytes that last only for a few weeks after rain has fallen, and spend the long dry intervals in the form of seed.

In dealing with the problem of relative primitiveness of character, which has proven such a Gordian knot to the phylogenist, the author presents the two extreme cases: (1) that simplicity of floral structure is often a primitive character, which is the basis of the Englerian system; and (2) the converse view, of which Parkin is such a strong protagonist, that the Ranalean type is primitive. Professor Bews

finds some support for both of these theories in his study of plant-forms in South Africa, and does not attempt to solve the riddle, suggesting a compromise. We ourselves are inclined to agree with Hutchinson in the view that both evolution and devolution have been working over a long period, and simultaneously in many plant phyla, so that one cannot claim that extreme simplicity of floral structure necessarily denotes phylogenetic affinity. In this connexion it is necessary to bear in mind that time is a most important factor, and that the term primitive is here used in its relation to the Angiosperms, and not to the Cryptogams.

It is impossible, of course, to present in lineal form on one plane an evolution which has developed simultaneously on several planes. And it is difficult, as Professor Bews points out, to reconstruct the family tree, since only the ends of the branches are left to guide us to their base, the parental stem and main branches having been lost in the enormous period of time which must have elapsed since the flowering plants first appeared.

Professor Bews wisely issues a caution against general conclusions too hastily drawn. As he points out, there have been so many cross-currents in the long period of the evolution of plants that it is now most difficult to tell one from another.

In conclusion the reviewer suggests that horticulturists interested in uncommon and beautiful floral treasures, not requiring tropical conditions for their successful cultivation, would do well to secure a copy of Professor Bews' book and study it carefully. He thinks it will stimulate the revival of horticultural interest in the numerous rare and beautiful plant forms awaiting introduction from South Africa, of which many would doubtless prove useful to the hybridist: the results obtained from crossings with the very recently introduced *Gladiolus primulinus* suggest that there are still great possibilities in this direction.

"The Lilies of Eastern Asia—a Monograph." By Ernest H. Wilson, M.A. La. 8vo. 110 pp. 16 plates. (Dulau, London, 1925.) 25s. net.

Probably every gardener and amateur who has given much attention to the cultivation of lilies in Great Britain must have come to the tantalizing conclusion that among them the percentage of failure and loss is higher than in any other genus of flowering plants. Immense sums are spent annually upon bulbs which, with very few exceptions, are long-lived perennials in their native lands; yet the gardens wherein lilies figure conspicuously and are reasonably permanent remain few and far between. There is no lack of literature on the subject; every trade catalogue prescribes what is considered the appropriate treatment for each species, and still the waste goes on. But among all the books and papers that have been written about lilies, not even excepting the great monograph by the late Mr. H. J. Elwes, there remained a void that could only be filled by one who had not only made himself familiar with lilies in the wild, but was experienced in their cultivation when imported. Such a treatise we now have and cordially welcome in Mr. E. H. Wilson's "Lilies of Eastern Asia." The author, having spent twenty years collecting and studying lilies in the field, gives first-hand information about the conditions under which they thrive, and indicates how generally we have failed hitherto to meet their natural requirements. While much may be expected as the result of more intelligent treatment, Mr. Wilson warns his readers that—

"It would be absurdly fallacious to contend that with knowledge and care

every lily-lover can successfully cultivate any kind of lily that pleases his fancy ; but knowledge and care will teach what particular kinds can be successfully grown, and in time convince the enthusiast that he must be content with a limited number."

Mr. Wilson provides a description of Asiatic lilies in their natural haunts, a historical summary of the introduction of some of them to Western Europe, and a key to the sub-genera and species, the latter supplying a much-needed clue through the existing confusion of nomenclature. The bulk of the volume—and it is this that gardeners will study with most interest and, we doubt not, with profit—consists of enumeration and description of the forty-seven species indigenous to Eastern Asia, with timely counsel as to their treatment.

Timely, indeed ! for, in the author's opinion, much of the disappointment experienced with this class of plant is the outcome of mismanagement. "All lilies," says Mr. Wilson, "grow naturally in places where they receive a mulch of fallen leaves," whereas in our country the common practice is to plant the bulbs in borders which are bare and sun-baked at the season when lilies send up young growth most desirous of shade or, at least, of liberal mulching with leaf-soil. The importance of this was borne in upon the present writer in a visit last year to a Scottish garden where *Lilium auratum* is grown in lavish profusion. Those in the garden were far from happy—weak stems, some with few flowers, others with none, many of them disfigured with Botrytis ; whereas those planted in an adjacent wood among bracken and grass were splendidly robust, with plenty of bloom.

Mr. Wilson has no good word for peat, prescribing leaf-soil instead. Of course there is peat and peat, and peat in a sour, lumpy state is poisonous ; but when well pulverized and exposed to sun and air for some months before applying it, there is surely little difference between it and leaf-mould. "Most species of lily detest peat," says the author ; "to many it is a deadly poison : to none, so far as we know, is lime essential." This may surprise those of us who have been taught to administer lime to *L. candidum*, *regale*, and a few other species ; but the warning is salutary.

Upon no point is Mr. Wilson more emphatic than in denouncing overfeeding, which he regards as a principal cause of disease and failure. As the discoverer of *L. regale*, he pleads with all who possess or will possess this treasure not to ruin its constitution with rich food. So with *L. auratum*, whereof the imported bulbs have already been unduly forced and fattened for the market. Medium-sized bulbs should be preferred to bloated ones, and these, says Mr. Wilson, "planted from 8 to 12 inches down in poor soil where drainage is perfect and among shrubs to protect the growing stem and leaves from direct sunlight, will, I am satisfied, flower and thrive as well in those parts of Europe and America where the climate is not too severe as they do on their native heath." To what a vista of splendour does not this point the way ! Be it remembered, also, that garden soil is usually the reverse of poor.

The volume under review should be in the hands of everyone concerned with this most fascinating genus, for it is the latest and best, though we hope not the last, on the subject.

"Gladioli." By A. J. Macself. 8vo. 158 pp. (Thornton Butterworth, London, 1925.) 6s. net.

This is one of the "Home Garden" series of books, and the sixth to be written by the same author. As a first introduction to the growing of the Gladiolus it should find many readers. Whether it is written from actual personal experience is not quite clear, but variations of the methods advocated are known.

Starting with a short summary of the chief species used in the development of the Gladiolus to what we see it to-day, we are told what a marked advance was made in the form and colour of the flowers by the introduction of *G. primulinus*. The hybrids from the use of this species have given us many art shades, and the author might have added a note with reference to the Herald and Prinsianus groups when dealing with the culture in pots. Both these new sections are likely to replace the old Nanus varieties for pot work, more particularly with amateurs.

In the chapter on "General Culture" it is suggested that the third week in February is a suitable time to start planting, if the weather conditions permit. Unfortunately, except in the south of England, the weather conditions rarely do permit. In our experience we have only once, during the past twenty years, started planting in the third week in February. However, the main point the author would, no doubt, wish to convey is that planting should be started so soon as the ground is or can be brought into a suitable condition. Nothing is gained by early planting in a cold soil.

As to spawn, or bulblets, these should be planted first, and, the author notwithstanding, we prefer planting them thickly in drills. Planting stock—small corms, not bulblets—are best planted an inch apart, three to five rows in a drill. There are some exceptions—'Purple Glory' is one. The bulblets of this variety are in many instances as large as hazel nuts, and will often produce a flower-spike the first year.

The digging and after-care of the corms also receive attention.

The book contains a number of illustrations, some in colour, but no names are given. Perhaps the author is wise in this, if they are not from flowers actually grown by himself. A recent instance came under our notice where no less than three illustrations were wrongly named. In this case we should also have no difficulty in giving some of the illustrations their true names.

"Rock Gardening." By Walter Irving. 60 pp. 8vo. (Country Life, London, 1925.) 2s. 6d. net.

A little book of clear directions, but, alas! condoning the use of concrete blocks in the rock garden. A word or two on wall gardening is incorporated, but the ideal way of planting while building the wall is not mentioned. Plants so put in are more apt to flourish than if the attempt to plant is made after the wall is finished. It might be out of place in this book to mention the growing of alpine plants in pans, but the reviewer thinks that the future cultivation of alpine plants will be largely in the wall type of garden for the more easily accommodated plants, and in the alpine house or frame for the more difficult. A useful list of plants, with notes, is given, but the latter might have been fuller. For instance, the advice to avoid lime where one desires to grow *Lithospermum prostratum* would have been helpful. One must not expect too much in such a small book, but perhaps a word here and there to encourage the grower to seek superior forms, and some others of warning where difficult plants are recommended, would have been helpful and wise. The proof-reading has, on the whole, been done well, but we notice a few misprints.

"A Garden Timepiece." By M. G. Kennedy-Bell. 8vo. 223 pp. (Hutchinson, London, 1925.) 7s. 6d. net.

This book hardly bears out what its publishers claim for it on the loose paper cover—viz. that it "is a practical guide to gardening written in a simple and interesting manner." It would have been nearer the mark to say that it is a help in certain gardening matters, which those with a little experience might find useful. Then the author has wandered so often from the narrow path of practice and digressed into very many quotations from Dion Clayton Calthrop (the name is always written in full) and many others, whose names appear less frequently and with less awesomeness; and into numerous asides as in the extra long one about "cannibal plants"; that in the end the practical teaching occupies nothing like the whole of the work, as one might have expected when the publishers make the claim they do for it.

Were the book wholly given to instruction the impersonal detached spirit in which it is written might be unavoidable or even praiseworthy, but as it is one feels as one reads a coldness in the writer which damps any enthusiasm in the reader. The writer's personality is effectually hidden. All we seem to be told is that the writer has a great weakness for the big mop-headed chrysanthemums! And all we can gather from a perusal is that the writer is a regular whale for quotations, especially from that anything-but-practical work, Dion Clayton Calthrop's "The Charm of Gardens."

This is a pity, and makes the book less interesting than it otherwise would have been. This sort of book, dealing with gardening matters in a rather general way, needs personality, and in "A Garden Timepiece" there is too little of it.

As the illustrations are the work of Reginald A. Malby, it goes without saying that they are good and the reproductions are all that they should be. Here again, however, the cardinal defect of the whole is apparent. They have no intimate connexion with the subject-matter among which they are placed; and in the copy sent for review two at any rate have not that firm connexion with the rest of the book which readers always appreciate.

We all like our books to be evergreen and not partly deciduous.

"Fruit Culture and Utility." By Donald McDonald. 8vo. 282 pp. (Hayes, London, 1924.) 6s. net.

The author has had a long experience as a writer for amateur gardeners and the present work will be useful to beginners. Much information has been

gathered from various sources, such as the publications of the R.H.S. and the Ministry of Agriculture, and it is in the main correct. A few slips, however, such as in the matter of stocks, reveal the difficulty of combining versatility with accuracy. A frequent repetition rather suggests that the book is composed of separate articles published at different times and should be remedied, in the interests of clearness, in a future edition. On the whole the book can be recommended to the adolescent fruit grower and it should stimulate many to grow fruit.

"The Principles of Vegetable Gardening." By L. H. Bailey. Ed. 18 Svo. 490 pp. (Macmillan, New York, 1924.) 20s. net.

The outward enticing appearance of this work, the eighteenth and revised edition by that well-known American horticultural writer, L. H. Bailey, gave fine promise of good things within, but it must be confessed at the outset that somehow the book disappoints one, although it is crammed with a wealth of matter appertaining to vegetable growing. Probably it is the rather wretched illustrations that cause this feeling, for they surely are not worthy of the writer's effort, nor a credit to the world-famous firm that published it. The pictures of some of the specimens of vegetables beggar description so poor are they; and surely a volume published at twenty shillings net could support the small extra cost that would be entailed in the provision of some really first-class photographic examples of the various vegetables dealt with! Other illustrations could remain as pen drawn without spoiling the effect, though we rather wonder whether the pictures of seedling vegetables are really worth inclusion as means of identification, for so many appear to be "just like each other."

The scope of the work is enormous, but is along the lines of American practice, and therefore not likely to prove of great help to English growers seeking knowledge of cultivation; but it deals with all sorts of subjects, such as market growing, farm-growing in some cases, the botanical descriptions of the races of plants, though here again, interesting as this may be, we rather fail to perceive the strict utility of such matters in what is presumably intended to be a sort of grower's handbook. If intended solely for academic instruction in Horticultural Colleges and schools, then we can understand the possible value of such, but if for the general public, as we presume it is, then this mass of detail is likely to prove a hindrance rather than a help to the tyro. From the English point of view, the most valuable part of the book is the magnificent effort to detail all likely pests, and the methods of destruction likely to prove efficacious. Incidentally, after reading them carefully through, one wonders at the necessity of the famous Quarantine No. 37 of the U.S.A. Government, for surely this formidable list of pests denotes that the American growers have every bug, beetle, fly, and disease that plants are heir to, and that no need exists to keep them out, for they are already there.

This mixture of subjects renders the book somewhat involved for reading purposes, and possibly robs the main theme of a little careful treatment that it might otherwise have had. For example, cabbages are dealt with in a way that suggests that "Well, after all, it's only a cabbage!" But surely there was room for detailing rather more clearly the wonderful range of Brassica as it exists to-day—the many varieties, their uses, and the enormous number of other forms of the same group, especially the kales. These are but passing thoughts, for there is one other small grumble. Why has he not dealt with the exhibition side of the craft? He speaks in one place of "slicing cucumbers" as being about 6 inches long. Would our English housewife be content with such a small, and, what she would probably describe most aptly, "miserable little thing"? and this thought, combined with the poorness of the illustrations referred to above, makes us believe that the plaint heard here, especially amongst American gardeners, that there is no interest in showing vegetables in America, is greatly justified. Let the Britisher commend further effort in this direction to the American at large, for there has been nothing in the past fifty years that has tended to do more in the improvement of the quality of vegetables on "this side of the pond" than the stern competition of the show bench; it has changed our vegetables for culinary use from poor, coarse, miserable stuff into a "thing of beauty and a joy for ever," and American visitors who have seen and tasted this improvement in vegetables here, in the form of those modern sorts used and produced for show work, will no doubt be ready to uphold the statement that the show bench has done more than its share in the improvement.

Other than these few points we congratulate Mr. Bailey on a real masterly effort.

"Plants and Man: A Series of Essays relating to the Botany of Ordinary Life." By F. O. Bower, D.Sc., LL.D., F.R.S., Emeritus Professor of Botany, University of Glasgow. xii + 365 pp. (Macmillan, London, 1925.) 14s. net.

This volume is mainly a reprint from the *Glasgow Herald* and is written in a simple style, with a careful avoidance of technical terms. Beginning with a general outlook and introduction to an account of plant life in its main aspect, the author passes on to consider the effect of the season and the differing clothing of plants in meadows, woodland, moor and mountain, seashore, the flower and kitchen gardens, fruits, cereals and vegetable foods. He then considers the mechanical structure of plants, timbers, textiles, parasites, the effect of fungi, and man's dependence on plants and his influence upon them, and concludes with a glossary and index.

It need hardly be said that Professor Bower, after a course of more than forty years as a teacher, has produced a most interesting volume, illustrated with figures from masters in the various aspects of botany, written in a charming fashion, widely removed from the old dry descriptions which formerly passed current for introductions to botany. The reader will be led on to the end with interest, and even the expert will gladly renew the early days of his first steps in botany.

"The Story of the British Annelids." By the Rev. Hilderic Friend. 8vo. 288 pp. (The Epworth Press, London, 1924.) 7s. 6d. net.

This larger work differs from the same author's "British Earthworms and How to Identify Them," in setting forth his more general investigations rather than descriptions. It is the result of thirty-five years of work among the worms of Great Britain and Ireland, set forth in a plain and easy manner.

Though we meet with worms so frequently in most operations of gardening, our ignorance of their structure and habits is astonishing.

The myth that the severed ends of an earthworm join together again is shown to be untrue, and the fact stated that only the head end can reproduce lost portions.

On the other hand, certain earthworms which produce their young asexually can be cut into as many as fourteen pieces, each of which can form to a perfect worm.

The question why worms occasionally die in great quantities occupies a long chapter.

Their enemies and parasites, climbing habits, and the way they come out of their burrows in response to gentle tapping, that may perhaps imitate the patter of raindrops, are a few of the very interesting facts concerning worms that are dealt with.

"Handbook of the British Flora." By G. Bentham and J. D. Hooker. Seventh edition. Revised by A. B. Rendle, F.R.S. 8vo. 606 pp. (L. Reeve & Co., Ltd., 6 Henrietta Street, Covent Garden, W.C., 1924.) 12s. net.

"Illustrations of the British Flora." By W. H. Fitch, W. G. Smith, and others. Fifth revised edition. 8vo. 338 pp. 1924. 12s. net.

These companion volumes will find a place on the book-shelves of all those anxious to learn the main framework upon which British botany is built. Since 1858 this work has held a position unique in itself. To know one's "Bentham" is to know the plants of the countryside in a broad sense. "Benthamites" are no "splitters," and the revised volumes under notice carry on upon the same lines as before.

Indeed, these may be said to be practically a reissue, with slight amendments and the addition of some of the recent discoveries in our Islands. One wonders why, however, *Scorzonera humilis* (Dorset) and *Statice lychnidifolia* (Channel Islands) have been entirely omitted, and *Stachys alpina* and *Leucosium vernum* have not been illustrated. Eight pages of text have been saved from the previous edition by the omission of the chapter on Vegetable Anatomy and Physiology; the classification and arrangement of families are amended according to the views of the present editor.

The species added are *Tillaea aquatica*, *Erythraea portensis*, *Prunella laciniata*, *Hydrilla verticillata*, *Carex microglochin*, *Koeleria vallesiana* and *Azolla filiculoides*. *Phleum asperum* and *Calamagrostis strigosa* have been omitted in this edition.

Many of the impossible and, one would have thought, never used "English names" are still to be found. Who talks about hunting for the Snaketongue Crowfoot or searching the mountains for Starwort Mouse-ear Chickweed, or the Whortle Willow?

Topographical botany has advanced far beyond the knowledge published in this work, and printed records show a far more extended distribution of many species nowadays, as the following examples illustrate. *Polygala calcarea* is not confined to S.E. England; it occurs as far west as Somerset. *Holosteum umbellatum* has been found in Surrey, *Cerastium cerastoides* in Cumberland; Scotland only is given for the latter. *Oxytropis campestris* is found not only "in one spot" (Forfarshire), but in Perthshire as well. *Carum verticillatum* is given as growing in Wales, Scotland and Ireland; it occurs in S.W. England and Surrey. *Cardus tuberosus* is reported from five vice-counties, not "only in Wiltshire." *Najas flexilis* grows in England; *Juncus tenuis* in thirty-nine vice-counties (instead of two as given); *J. capitatus* in Wales; *Carex aquatilis* and *Phleum alpinum* in Northern England and not Scotland only; *Isoetes Hystrix* is not confined to the Channel Isles, but has been found in Cornwall. The list could be considerably extended.

The new volume of Illustrations is excellent and familiar, but if one compares them with those issued in 1892 (the date of the sixth edition of the Handbook) the blocks show, in many cases, signs of long use. It would have been well perhaps, to have had new drawings of some species—No. 148, *Sagina saginoides*, for instance, which no one would recognize in the field. The petals are shown half as long again as the sepals, in spite of the description "not longer"!

No. 246, *Trifolium arvense*, No. 1142, *Carex pallescens*, No. 1239, *Poa rigida*, are particularly poor. No. 393, *Drosera longifolia*, is almost certainly *D. rotundifolia* × *anglica*. No. 872, *Polygonum dumetorum*, the fruit figured seems that of *P. convolvulus* var. *pseudo-dumetorum*. No. 1055, *Allium triquetrum*, surely represents some other species?

No. 1227, *Festuca Myuros*; the plant figured is the commoner *F. bromoides* a (*sciuroides* Roth), and in the text (p. 554) a curious error has arisen owing to the names *F. Myuros* and *F. bromoides* being transposed. This may cause confusion to students.

The Classification and Analytical Key preceding the illustrations add very greatly to the value of the separate volume.

"Sweet Pea Culture." By Donald Allan. 8vo. 32 pp. (Dobbie, Edinburgh, 1925.) 6d.

Mr. Donald Allan tells how he grows sweet peas, with what success all visitors to our shows know. Some of the details of his methods would not be suitable to all soils or circumstances of course, nor are the methods he adopts the only ones which will produce good results, but at any rate the novice who starts with a good deep soil and follows out the plans detailed should go far to obtain satisfying growth and abundant fine flowers.

"The Story of My Ruin." By Mrs. M. Cran. 8vo. (Herbert Jenkins.) 10s. 6d. net.

Describes the renovation of a tumble-down cottage, not the deterioration of a character.

Those who like their gardening reading mingled with other matters as thoroughly as the lucky sixpence in a Christmas plum-pudding will find interest in extracting it from this medley. A total disregard for the correct use of capitals in generic and specific names, the absence of the first 'i' in *Aubrietia*, and such slips as 'Roualia Australis' will seem to others like biting on the pips that should have been extracted from the raisins.

The pleasantly chatty style of the writer and the little gems of wisdom gathered from conversations with the plumber or the charwoman entice the reader to try another chapter hoping for the hidden silver.

"Flowering Trees and Shrubs." By A. J. Macself. 8vo. 224 pp. (Thornton Butterworth, London, 1924.) 6s. net.

The avowed object of this little book is to popularize trees and shrubs, and also to instruct. It will not bear comparison with other small books recently published on the same subject, but it is attractively got up, and the thirty-five illustrations (some in colour) are well chosen. In order to write with real success a small book dealing with so vast a subject, a very full equipment of knowledge is needed and also more care for accuracy in details than Mr. Macself has given to his task.

"The Old English Gardening Books." By Eleanor Sinclair Rohde. 8vo. xii + 144 pp. (Martin Hopkinson, London, 1924.) 15s. net.

Miss Rohde has quickly followed up her "Old English Herbals," published in 1922, by the present volume, charmingly written and admirably printed and

illustrated with sixteen collotype plates of pages from selected volumes and many text-figures. Beginning with Thomas Hyll, or Hill, who also called himself "Didymus Mountaine," a play upon his name, his "Most Briefe and pleasaunt treatyse," which saw the light in 1563, is the first taken up by the author, who points out that this is not the first nor only book on gardening written by Hyll, who wrote on many subjects. Miss Rohde quotes much from this small volume before passing on to later Elizabethan writers—Tusser, Gardiner of "Shrewsberie," and Sir Hugh Platt. Books translated from the Dutch and French follow, such as Crispin de Passe the younger (whose book is illustrated with fine copper-plates of flowers and gardens), Leonard Mascall, Surfflet, William Lawson, Gervase Markham and our own John Parkinson, the "Paradisus" of the last being styled by the author, "that most lovable of all gardening books." The later seventeenth-century writers, William Cole, Ralph Austen, John Beale and Robert Sharrock are mentioned, but only Austen is treated at length, his "Treatise on Fruit-trees" of 1653 being selected for comment, with a short notice of his "Dialogue betweene the Husbandman and Fruit-trees" of 1676. La Quintinye's work, Englished by John Evelyn, brings us to a collection of Knots and Mazes, the volume closing with an ample bibliography.

The author's delight and enthusiasm in these mostly small and unpretentious volumes will probably be shared by the possessors of this pleasant treatise on an early phase of gardening in this country.

"Einjahrsblumen, Beschreibung, Pflanzung, Pflege und Verwendung der Einjährig im freien zu ziehenden Blütengewächse." By P. Kache and C. Schneider. Square 4to. 171 pp. (Parey, Berlin, 1924.)

This excellent book upon the cultivation of Annuals is worthy the attention of all who are interested in gardening and are also acquainted with German. The descriptions and references to variations which occur in annual flowers are well done, the cultural directions clear, and the list of plants catholic. The photographic illustrations are numerous and good, and the coloured plates above the average. Copious lists according to colour, season, height and so on, and suggestions for the arrangement of plants in beds for garden decoration add to the consultative value of the book.

"The Horticultural Exhibitor." By A. J. Macself. 8vo. 222 pp. (Thornton Butterworth, Ltd., London, 1924.) 3s. 6d. net.

Mr. Macself is to be highly congratulated on No. 6 of "The Home Garden Books," for, in dealing with practically all points connected with Horticultural Exhibiting, he has filled a long-felt want for the average amateur showman; and who shall say that many an old exhibitor could not, with advantage, glean many a helpful hint? for the work is packed as fully with sterling advice and "tips" as the proverbial egg is of meat.

Taking one of Mr. Macself's own phrases literally, we will endeavour to "discover the weak points—there are generally some" (p. 138), though not an easy task, as the work has evidently been carefully thought out and compiled, and, generally, advice on feeding, thinning, packing, and staging is excellent.

The opening chapter, on the impetus of the show bench, and the benefit accruing from it, is remarkably true, and the caution against extremes very necessary nowadays. The suggestions in the third chapter for escaping from the decidedly "in the rut" table decoration classes are very good, though a warning against the use of colours, in flowers, that prove hopeless under artificial light, a frequent fault with this class of show work, would have improved matters, as would a caution, when again dealing with the same subject on p. 218, against employing fading or drooping blossom, and the indiscriminate mixing of various flowers, such as one too frequently sees.

In the second chapter the author is somewhat severe on the mental calibre of present-day judges, for, we would remind him, the majority are showmen of high level, and, therefore, mostly keeping well up with modern ideas and devices for the benefit of their own efforts in stern competition with their fellows, and are quite alive to the need for "radical changes" *when desirable*.

Illustrations in the book, both half-tone and line, are good; but, being interested to see that of the rose shade referred to on p. 22, and finding no clue to its position on that page, we had to turn to the index to locate it, and whereas in some instances the useful reference is given, in others it is missing—a rather confusing point.

"Some plants have two names," writes Mr. Macself (p. 54), but one could add "many plants have many names," as momentary reference to the Kew Handlists will show, and on the point of nomenclature we would draw the

author's attention to a happening we think he has overlooked in reading his proofs. The Vienna Conference set up a standard in scientific plant names which we do not think permits the use of capital letters for such words as 'Orientale,' 'Bullata,' 'Europaeus,' and these show up rather badly against such examples as 'mussini,' 'delavayi,' 'listeri,' 'moreana,' 'jaurezii,' and others, which are entitled to capitals; and when the writer prepares further editions, as we hope and believe he will have occasion to do, we would appeal to him to watch this point.

It would have been an advantage if, on p. 79, where he deals with the need of clean foliage for Delphiniums, a hint had been given for the benefit of the tyro how to accomplish this, and the paragraph on packing these flowers is rather vague and could be improved by thoughtful rewording.

We must join issue with the advice given on p. 80 against bringing "harsh sub-soil to the surface," for this is still a controversial subject on which the leading growers "agree to disagree," and it will probably be a "bone of contention" for years to come.

Page 95 provides another case of rather lax wording, for in suggesting changing Pæony buds from "lukewarm water" to "fresh warm water," the idea might easily be gleaned to increase the temperature, which surely the author does not mean? A word or two might well have been added on p. 155 as to the requisite standard of Fuchsia flowers, which, after all, is one of the principal points of a well-trained plant.

On exhibition vegetable matters we must be a little more severe, for to start with we do not quite like the suggestion to mount show Onions on boards as suggested on p. 192, and hang their growths over the top of the board; rather we prefer, if shown with their tops on, to see them laid flat in pyramid or similar fashion. Rather a pity, too, it is to find no caution against "frothiness in Cauliflowers," a frequent blemish to this vegetable at shows!

Cucumbers may be straightened in glass tubes, but we much prefer the wooden trough and cork slips in attaining this desirable end. Of the suggestion to replenish the bloom on peas by steaming—well, the less said the better!

Another little point that has apparently been overlooked is where the advice is given on p. 204 that "large size should be considered a fault," with reference to Shallots. This is true for the pickling article; but some schedules have classes for Cooking Shallots, when size might well be considered a cardinal virtue.

Now comes a very important point, with which we must be at variance. In dealing with collections of vegetables, Mr. Macself, referring to the distinction between the terms "kind" and "variety," states that Cabbage and Cauliflowers being both Brassicas, must not be shown in the same collection; yet the Royal Horticultural Society's "Code of Rules for Judging," that estimable *vade mecum* for all horticultural judges, definitely sets out in sect. 86 that "For exhibition purposes the following are considered to be distinct *kinds* of vegetables, viz.: Cauliflower, Brussels Sprouts, Cabbage, Borecole or Kale, Savoy. Cauliflower includes Broccoli, and for exhibition purposes is not distinct from it," and we are of opinion that all responsible judges will still hold to the Royal Horticultural Society's Code.

Following right on this comes another important and debatable table, possibly the author's own, showing the point values of various vegetables and the number of specimens that should comprise a dish, but the figures in this do not agree with those of the before-mentioned Code of Rules, as set out in sects. 85 and 85a, and we consider it a pity Mr. Macself has again departed from the standard that so widely holds in the horticultural world.

Advice on fruit is excellent, and the only points we note are the omission of reference to some schedules calling for dishes of Black Currants comprising a definite number of separate berries, and as to care in the preservation of "bloom" on Grapes and Apples when setting these up for exhibition, two rather important matters in careful showing.

It will be seen that most of the items referred to, other than the vegetable standards, are of minor importance, and again we would congratulate Mr. Macself on the production of a volume that should be in the possession of every exhibitor, large or small, and should most certainly be found in the library of every horticultural society in the British Isles.

"Colour Planning of the Garden." By G. F. Tinley, T. Humphreys, and W. Irving. La. 8vo. 288 pp. 50 col. pls., 300 il. (Jack and Nelson, London, 1924.) £2. 2s. net.

Fortunate indeed are the compilers of this book in having Miss Jekyll to introduce their work to the public. Her vast experience, and her deep-rooted

love of the beautiful in gardens, make her a pre-eminent authority on the all-important phase of garden planning, especially of hardy perennials for colour effects. We notice that Miss Jekyll, while deprecating that period when gardens were formally filled with the Geranium and Calceolaria edged with Lobelia, does not speak disparagingly of the plants themselves, observing that there is even to-day a proper use for these plants in the colouring of our gardens, a fact too often forgotten by those "Modernists" who pretend to see no beauty and no value in certain plants simply because they have been used in schemes which appear, and no doubt were, inartistic, harsh, and stereotyped.

Splendid indeed is the list of well-known plants that are suggested as a year's pageant of colour, nothing, perhaps, being more pleasant than the use of those old-fashioned and simple flowers, which are apt to be despised by some simply because they are "common." Take a couple of instances: *Megasea*, *Hellebores* in flower, and nut trees, simple, effective, natural—and all in February; a spacious clearing in a grove of Oaks where the simple Wild Primrose can be grown in thousands.

Coming to the great breadth of colouring which we call herbaceous borders, we are reminded of the change which later years have made by the inclusion of many foliage plants simply for their colour: golden privet, *Prunus Pissardi*, dark bay trees, the silver of *Eryngium*, *Cineraria maritima*, *Santolina*, and *Senecio*, all used as part of one large scheme, advancing by their presence the value of other more brilliantly coloured plants around them. The whole of the introduction is a great triumph, and written by one who has spent a busy life painting wondrous pictures in her own garden.

Garden Styles.—The real object of the book, as Mr. Tinley tells us, is the colour classification of plants. This, we think, will fill a need that is very apparent just now, when, in the changing order of garden-making, the colour and height of a plant will be the first consideration in its use. He further touches briefly on certain styles of gardens, and suggests many plants for use, and if one criticize these at all it would be on account of their brevity. A volume such as the one under review is naturally bulky, but, even so, we think there might have been an enlargement of these notes by Mr. Tinley.

Photographs of Various Gardens.—To our mind this part of the book has been cut far too short, and a few more pages with four views on a page would have been a great assistance to all in planning a garden, and would have been more in keeping with pages devoted to plants for the planting of these various gardens.

The book contains 288 large pages devoted to the classification of plants in their respective colours, the list of yellow flowers alone taking up 64 pages; the natural order of each plant is given, its time of flowering, native habitat, and height.

The list is apparently very exhaustive, and the greatest care has been expended on some of the families, and the inclusion of varieties and species of little-known but useful garden plants has been successfully carried out all through the book.

The grouping of all plants under specific colourings is a novel idea and a very helpful one, giving the garden-maker, using this book as his guide, a very thorough and practical encyclopædia of garden inhabitants. The coloured drawings by Miss Anson are distributed through the book. All of them are very truthful in their drawing, but having six subjects on one page one seems to lose all idea of proportion. The colouring of the majority of the plates is excellent, only a few not being up to the standard of perfection; this is not the fault of the artist but the printer. This slight fault does not, in any way, detract from the useful purpose they are meant to fulfil. This is a book that should be included in the library of every garden enthusiast.

"Rats and How to Destroy Them." By Mark Hovell, F.R.C.S. 8vo. 465 pp. (John Bale & Danielsson, London, 1924.) 10s. 6d. net.

As a lover of the country, Mr. Mark Hovell has had an extensive experience, shared by all gardeners, of the depredations of the rat tribe. As a distinguished surgeon and scientist he is under no illusions about the rat as a certain carrier of disease.

This book, the outcome of a persistent campaign waged by Mr. Hovell for the last forty years, should certainly fill a gap in the general reference library.

Apart from an interesting and highly laudatory introduction by Mr. S. L. Bensusan, himself no mean authority, the book is arranged on clear lines.

After dealing with the habits of rats and statistical matter, successive chapters are devoted to Traps and Trapping; Ferrets, etc.; Poisons; Blocking; Flooding; Fumigation, etc.

Then, each vermin destruction problem is treated separately, e.g. rats in the

house, shop or warehouse, the garden, outbuildings, river, stream, or ornamental water, on a ship, on a shooting estate, and so on.

Arranged in this form, a sufferer by the depredations of rats or mice merely has to turn up the particular chapter without of necessity being compelled to read the whole book.

In some respects this arrangement is open to the objection that certain paragraphs recur in successive chapters, but the author's aim to put the matter briefly and clearly could not otherwise be attained.

There are interesting notes on plague and cancer, with brief chapters on cockroaches and sparrows.

Every chapter is, however, based on experience and dictated by common sense. Whilst every single rat-destroying device that can be thought of is mentioned, the book is not overloaded, contains a wealth of useful hints, clear illustrations (enabling the amateur to make many of the traps for himself) and simple, lucid text.

The only point of criticism that can be made is this: In the statistics, prepared on the most conservative lines, no allowance has been made for "casualties" that certainly and fortunately occur.

Again, in the chapter on poisons, it appears that the dried bulb of *Scilla maritima* is amongst the most effective. If it be possible for gardeners in the more favoured seaboard climates of England and western Scotland to propagate and grow this bulb in English gardens, one of the great difficulties of vermin destruction, viz. expense, automatically should be removed.

"Insects: Their Structure and Life." By G. H. Carpenter. xi + 335 pp., 184 figs., 4 coloured plates. (Dent & Sons, Ltd., London.) 10s. 6d. net.

This book is intended as a primer of entomology, and is the second edition, being considerably revised from the original published twenty-five years ago.

The whole aspect of the subject is dealt with, and the several chapters deal with morphology, life-history, classification and evolution, insects and their surroundings, and the pedigree of insects and allied groups.

Brief notes are given to each family, the important species are mentioned, and stress is laid on those of economic importance.

A very useful section of the work is devoted to a comprehensive bibliography of 237 works, each chapter having numerous references thereto.

This reasonably priced book is within the reach of all those interested in the vast subject of entomology and should be kept as a reference book by all students and teachers in this branch of science.

"Handbook of Practical Botany." By Dr. Strasburger. Ed. 8. Revised by W. Leach. xviii + 533 pp. 8vo. (Macmillan, London, 1924.) 12s. 6d. net.

The seventh edition of this book was published in 1911, and but few alterations have been made in the present, except that some more modern illustrations of apparatus have replaced old, and an account of additional staining methods has been added as an appendix. This book has been a valuable aid to students since its first appearance in 1887, and is likely to hold its place for a considerable time to come.

"Practical Pruning for all Growers of Fruit, with supplementary chapters on Pruning Roses and on Spraying." By J. W. Morton. 12mo. 137 pp. (The Lockwood Press, London, 1925.) 2s. 6d. net.

This small work will be useful to beginners in pruning, and, though it falls far short of what one might have hoped, it will have a certain value.

The writer is much impressed with the influence of stocks upon trees, but somewhat contradictory in his remarks. There is not yet, as he says, "a sufficient choice of stocks to suit every requirement"; a really dwarfing stock for plums is yet to seek.

His pruning instructions are fairly sound, but lack clarity, owing to the absence of an accurate terminology for different parts of the tree.

He has read recent research in the matter, but in some cases has failed to grasp its drift. In a chapter on Lorette pruning this is rather conspicuous, and his reference to a "dard" as a bud shows that he has hardly grasped the need of accurate nomenclature, as does his indiscriminate use of the words "shoot" and "branches."

In the section on nut pruning no mention is made of the removal of suckers, which are so conspicuous a feature in the trained bush nut tree.

There are several illustrations, some of which are rather reminiscent of the heraldic devices of the Herbals of the Middle Ages.

"Garden Improvement." By T. G. W. Henslow, M.A. 8vo. clv + 368 pp (Dean & Son, Ltd., London, 1924.) 15s. net.

This book has two unique features, one at the beginning and the other at the end. The first occurs immediately before the introduction, and is a list of about 140 traders. This list, the author says, "is a most unique one," and we are inclined to agree with him. The other feature which we regard as unique consists of about 120 pages of advertisements.

Upon opening the book we chanced upon the following passage: "Unlike his brothers in other sections of the commercial world, he" (the horticultural trader) "has not yet learnt the full value of advertisement." And while pondering this dictum we idly turned the pages, glancing at the illustrations, among which we noticed one of the Carnation named after the author, and one of the Chrysanthemum named after the author, and one of a robin's nest built in a tin which had contained a proprietary manure. Then, remembering that we had been bidden to review the book, we turned to the introduction, for in the introduction one may expect to find something about the objects of a book, and some idea of these is necessary for a proper appreciation of the work. There we read, among other things, "First, I would thank all those traders who have supported me by way of advertisement or trade announcements at the end of my book. Without this trade support my work could never have been published . . ." With this passage in our mind we were able the better to appreciate the book and the reason why traders' names and proprietary articles are mentioned again and again throughout its pages.

There are 33 chapters, 18 of which are concerned with particular types of gardens. Thus there are chapters on "The Bulb Garden," "The Rock Garden," "The Fern Garden," "The Japanese Garden," etc., and the reader who finds that "it is not easy to remember names and addresses of firms" which supply the requisite plants, tools, garden ornaments, etc., will discover that the author has very thoughtfully anticipated his weakness.

One chapter deals with "The Greenhouse," and the matter is divided into four sections in a rather unusual manner; thus (1) The placing and construction of a Greenhouse, (2) Winter Gardens, (3) *Primula sinensis*, and (4) Orchids for Amateurs. Cultural directions do not constitute a prominent feature of the book, but for some reason a good deal is said about the treatment of orchids and *Primula sinensis*. In the directions for raising the latter plant we read that after placing each seed by hand at one inch from its fellows the seeds should be covered with about a quarter inch of soil, and that the pans should then be watered through a fine rose!

"The Herbaceous Border" has a chapter to itself consisting of 34 pages, of which 17 are given up to the Chrysanthemum. The allocation of these 17 pages is also interesting. Two-thirds of a page deals with the history of the flower; one-third of a page is considered sufficient for the cultivation which "is quite an easy matter"; and the remaining 16 pages deal with varieties, much space being devoted to particulars of "Large Exhibition Japanese Varieties."

There are also chapters on "Lawns," "Trees," "Shrubs," "The Kitchen Garden," "The Fruit Garden," "Garden Ornamentation," etc.

The author has a style of his own, which we gather he considers "somewhat breezy." In that connexion the following passage may be quoted from the chapter on "The Carnation Garden." "To establish a new style of garden in the Horticultural World is not an easy matter, for it takes considerable time before even the most approved ideas can filter through to the interested public. To change a comparatively small flower bed into a perfect garden sounds very much as if someone possessed a fairy wand which could be used to very great effect. In truth, I gladly confess to being endowed with such power and to having been entrusted with the wand of a fairy queen. The hand that holds the pen is mightier than the combined forces that control the spade! My pen was the fairy wand that called into being the first Carnation Garden really entitled to bear this name."

The author has endeavoured to make the book "as free as possible from . . . the too prevalent highly botanical vocabulary." This desire possibly accounts for the occurrence of such names as *Citisus Ardonii*, *Calceolaria polyphiza*, *Primula Busiana*, *Daphne ancorum*, *Spiraea*, *Senecio*, and the like, and for the allocation of capitals in such names as *chimaphila maculata*, *Sinenis*, *unado*, *Obconica*, *asarina*, and *Montana*. Similar departures from the usual standards may be noticed in "Soloman's Seal" and "Safron."

The book is profusely illustrated. There is, however, no index, but instead just inside the back cover the reader will find upwards of 12 pages advertising another book by the same author.

"Vegetable Growing." By George Garner. 8vo. 73 pp. (Country Life, Ltd., London, 1925.) 2s. 6d. net.

Within the pages of this small book (one of "The Half-Crown Garden Books") the author has attempted to cover the whole field of vegetable growing from aubergines to vegetable marrows, and in addition to ordinary cultural directions he has squeezed in chapters on exhibiting and pests. In consequence he has been so brief that the old hand will find that the book contains nothing new, while the beginner will be disappointed in his search for details. Generally the very brief advice is sound, but we do not think it is wise to sow parsnips on land which has been "well enriched with organic manure" in "the previous autumn," nor do we think that a similar plan is to be recommended for either beets or carrots. Under "Seakale" we read that "thongs or roots may be planted close together in drills in March, and finally planted out the next March." And that, by the way, is all the author has to say about the vegetative propagation of this crop. In the chapter on pests the reader is warned about the leaf disease "called *dactylium* (sic) *roseum*," which the author regards as one of the three fungus ailments of tomatoes, and directions are given for the making of an "emulsion" for bean aphid by boiling soft soap in water, but we fear that after one ounce of soap has been dissolved in nine gallons of water, as recommended, it will not make a very effective insecticide.

"Profitable Bush Fruit Culture." By J. W. Morton. 8vo. 63 pp. (Ernest Benn, Ltd., London, 1925.) Paper covers, 2s. 6d.

Whilst much sound, practical advice concerning the general management of Gooseberries, Raspberries, Black, Red, and White Currants is given in this little book, not always do the author's recommendations follow generally accepted practices, and important details of many operations are omitted.

"Crop-production in India." By Albert Howard, C.I.E., M.A. 8vo. 200 pp. (Oxford University Press, 1924.) 10s. 6d. net.

This book, of the round number of 200 pages, is the ripe fruit of the author's long experience and unexcelled knowledge of Indian agriculture, compact of the seeds of future development. Although from time immemorial India has been, and is likely to remain so for ages to come, a land of peasant agriculturists, and although centuries of experience and tradition have made the peasants within the limits of their knowledge laborious and skilful cultivators, their ignorance of the principles of scientific agriculture and their poverty have been insuperable bars to the improvement of agricultural methods and production by their own efforts.

It has therefore become the duty of the Government of India and the Indian Provincial Governments to foster what is by far the pre-eminent industry of India. These Governments cannot be accused of undue alacrity in recognizing their responsibilities to agriculture or acting thereon. The first century and a half of the English connexion with India were too much taken up with trading and wars for agriculture to receive attention. Although before the end of the eighteenth century the desirability of improving the agricultural practice and produce was recognized, it was not until about one hundred years ago that the first organized attempt in this direction was made by William Carey, the celebrated missionary, and his associates, who founded the Agri-horticultural Society of India in 1820. Although this Society did excellent work within its sphere of influence for many years, it had not the organization or the means to carry out far-reaching reforms. Half a century later the Government of India created a department of Revenue and Agriculture, but for the rest of the century there was an intolerable deal of Revenue to very little Agriculture in the work of the department. It was not until about twenty years ago that a scientifically staffed Imperial Indian Agricultural Department came into being, while at the same time a Board of Agriculture was established.

The investigations carried out during those twenty years by the small band of searchers, of which the author was a distinguished member, have resulted in many improvements in crop-production and seed-distribution that have repaid India many times over the cost of the staff and equipment, but they have also brought into prominence certain large problems, the solution of which is essential to further progress. The theme of this book is to explain these problems and how they affect the future development of Indian Agriculture and to arouse the interest of the public and of investigators in their solution.

The author divides his theme into three natural and logical movements: the Soil, the Crop, and the Organization for their investigation. Under "The Soil" are discussed surface-drainage and erosion, soil-aeration, irrigation and

water-saving, the problems connected with the supply of nitrogen and the avoidance of alkali formation in the soil.

Under "The Crop" a general and luminous discussion is given of the bearing of root-development on the cultivation of both upper soil and sub-soil, the improvement of varieties, the conditions governing seed-distribution in India, the problems connected with the production and storage of fodder, the lines of attack likely to be most successful against the diseases of plants, fruit-growing in India and the difficulties that hamper its development. The more important crops like Cotton, Wheat, Rice, Sugar Cane, Fibres, Oilseeds, Tobacco, and Pulses are suggestively treated in separate chapters.

Under "Organization" Mr. Howard outlines his ideal investigator, possessed of a wide outlook, studying his crop plants as living creatures reacting to every aspect of their environment and not merely as exercises in botany, chemistry, and physics, and a practical agriculturist to boot. The disadvantages of State control of research are plainly set forth and the suggestion mooted that these disadvantages—at present unavoidable in India—might be overcome by separating all research from the ordinary machinery of Government and placing it under a Development Board, supported by a Development Fund. For the individual investigator the necessary conditions are freedom in the conduct of research and in publication of results, security of tenure, adequate remuneration and—as, after all, even the ideal investigator need not be indifferent to appreciation—rewards such as fall to workers in other branches of scientific or social activity for results of outstanding importance. Considering that the prosperity of India is rooted in her soil, it would pay her handsomely in the long run to take these conditions to heart and act upon them. Although Mr. Howard's book is titularly concerned only with India, its breadth of outlook makes it an indispensable volume for all who are in any way interested in the vegetative productions of the tropics and sub-tropics.

The volume is well printed, and has an index and an excellently selected bibliography at the end of each chapter.

"Experiments in Plant Hybridisation." By Gregor Mendel. 8vo. pp. 313-353. (Harvard University Press, Cambridge, Mass., 1925.) Paper, 1s. 6d.

This is a reprint of the translation of Mendel's experiments which appeared in our JOURNAL many years ago, with a few added notes. It is published in England by the Oxford University Press.

NOTES AND ABSTRACTS.

[For Index of Periodicals quoted see previous volumes.]

Aphididae, The Migration of the : and the Appearance of the Sexual Forms as affected by the Relative Length of Daily Light Exposure. By S. Marcovitch (*Jour. Agr. Res.*, xxvii. No. 7, Feb. 16, 1924, pp. 513-522).—Experiments were carried out to ascertain the influences of length of day and temperature on the production of the sexes of several species of Aphididae. It was found that sex production and migration could be controlled experimentally by subjecting the several hosts to definite amounts of daily light exposure regardless of temperature, at least in the temperate zones.

The fact that root-feeding species, away from light, produce eggs in the autumn seems to point to there being a chemical change in the sap of the host plants. Experiments with one of the Apple Aphides, *Aphis sorbi* Kalt., would indicate that the short autumnal days stimulate the production of autumn migrants, and the lengthening days of spring stimulate the production of spring migrants to take up their abode on the plantain.

The species of Aphides used in the tests were : bean aphid (*Aphis rumicis* L.), olive aphid (*Capitophorus hippophoes* Koch.), rosy-apple aphid (*A. sorbi* Kalt.), viburnum aphid (*A. viburnicola* Gill.), and woolly aphid (*Eriosoma lanigera* Hausm.).—G. F. W.

Aphis, Green Peach. By W. B. Gurney and W. le Gay Brereton (*Agr. Gaz. N.S.W.* vol. xxxv. pp. 667, 668).—Spraying with red oil emulsion when the trees are dormant is an effective protection from attacks of the Green Peach Aphis (*Rhopalosiphon persica*).—S. E. W.

Apple Black Spot. By H. A. Miller and W. le Gay Brereton (*Agr. Gaz. N.S.W.* vol. xxxv. pp. 591-596).—Burgundy and Bordeaux mixtures are more potent agents for preventing Black Spot than lime sulphur, but unfortunately they cause the apples to russet badly.—S. E. W.

Apple-Bud Weevil, The ; Anthonomus cinctus Koll. By F. R. Petherbridge and J. W. Cowland (*Ann. App. Biol.*, vol. xi, Nos. 3 and 4, Oct. 1924, pp. 482-497 ; 10 figs., 1 plate).—An investigation as to the economic importance of this apple pest in Britain, where it has been introduced from the Continent.

Detailed descriptions are given of the several stages, and the life-history and host plants are fully dealt with.

A single egg is laid in an apple bud (usually a fruit bud) in the autumn. The larva emerges at the end of February, and eats out the succulent portion of the bud. Pupation takes place in May, and the adult emerges in June, at which time it punctures the leaf stalks, buds and succulent portions of the shoots.

Keys are given to the identification of this and allied species.

The parasite (*Pimpla pomorum*) of an allied pest—the apple-blossom weevil (*Anthonomus pomorum*)—killed a large percentage of larvæ and pupæ left on the trees in the Cambridge district.

The only control measures suggested are the removal and destruction of the infected buds in the spring when the normal buds have opened, and at which time the attacked buds are easily distinguishable.—G. F. W.

Apple Diseases. By D. H. Rose (*U.S. Dept. Agr. Bull.* No. 1253, July 1924, pp. 1-24).—Apples are the most important fruit crop in the United States, and the commercial value runs into millions of dollars per annum. The diseases noted are those found in stored apples, and include rots, scald and scab, water core. The data collected extend over four years. Blue mould rot appears to be the most prevalent disease, with scald and black rot as the next in order of prevalence. Various control measures are suggested.—A. B.

Apple Peels, Isolation of Quercetin from. By Chas. E. Sands (*Jour. Agr. Res.*, vol. xxviii. No. 12, June 1924, pp. 1243-1246).—One of the first indications of scald in apples is the appearance on the greener parts of the fruit of a typical brown discoloration. A possible relationship between the suspected occurrence of a flavonal pigment in the skin and scald led to the isolation and

identification of this pigment. The particular flavonol colouring-matter proved to be quercetin $C_{15}H_{10}O_7$, which was identified by its penta-acetyl derivative and by combustion of the purified pigment itself. It is suggested that quercetin, or its glucoside, may be the chromogenic substance causing brown pigment in the peels of scalded apples.—*A. B.*

Apple Scald, Oiled Paper in the Control of. By Chas. Brookes and J. S. Cooley (*U.S. Jour. Agr. Res.* vol. xxix. No. 3, Aug. 1924, pp. 129-136).—Oiled barrels and oiled liners have reduced scald on the outside apples but has little effect upon the package as a whole. Oiled straw, shredded oiled paper, and layers of oiled wrappers give as good results as wrapping the apples in oiled paper. Shredded oiled paper gives the most satisfactory method of scald control for the barrel package. The success of this depends upon the thoroughness with which the oiled material has been distributed in the barrel.—*A. B.*

Apple Tree Canker. By W. A. Birmingham (*Agr. Gaz. N.S.W.* vol. xxxv. pp. 525-527; 3 figs.).—The fungus *Dothiorella mali* causes canker on apple trees. Cut out and burn the diseased parts and treat the cut surface with Bordeaux paste.—*S. E. W.*

Apple Tufts. By C. C. Carpenter (*Bot. Gaz.*, 78 (1924), p. 414).—In the investigation of the white growths that appear on the carpel walls and seeds of some varieties of apples, and considered by Sorauer to be the hyphae of a non-parasitic fungus, the author comes to the following conclusions:—Tufts in apples are not fungi, but are tissue proliferations developed in carpel fissures in certain varieties of apples. They are found in high percentages in some of the longest-keeping varieties, and, while they may be a factor in decay, apples containing them will store without decay for long periods. The tufts are not correlated with open core, open calyx, or with abortive seeds. In 'Northern Spy' tufts develop when an apple has a low seed-content for its size.—*W. J. D.*

Apples, Freezing injury to. By H. C. Diehl and R. C. Wright (*U.S. Jour. Agr. Res.* vol. xxix. No. 3, Aug. 1924, pp. 99-128; 5 plates).—The freezing-point temperatures of a large number of important commercial varieties of apples have been determined. The average freezing point was 28.5°F ., the maximum 29.4°F ., the minimum 27.8°F . Cooling apples below their freezing points without the formation of ice in the tissue does not cause any visual injury or perceptible softening of the fruit. Ice formation appears to spread slowly in the tissues of the apple compared with other plant organisms. Apples, if bruised when they are hard frozen, show much more serious injury than does a similar pressure on unfrozen fruit. Therefore handling while frozen will result in more or less severe bruising. The point at which visual injury results in apples varies with time of exposure, with the variety and the individual apple. The fruit in the lower part of a package held under freezing conditions is exposed to a greater danger of freezing injury than those in any other portion of the package. Keeping properties are greatly impaired of frozen apples. The tissues become softer and mealy after thawing and cannot stand storage and market conditions, even if there is no direct discoloration.—*A. B.*

Apples, Watercore in. By W. A. Birmingham (*Agr. Gaz. N.S.W.* vol. xxxvi. pp. 59-62; 2 figs.).—The intercellular spaces in a normal apple are filled with air, but when these spaces are filled with sap the apple suffers from watercore. When the rate of transpiration is checked by excessive humidity in the atmosphere or by cold nights following hot days, at the same time that the roots are rapidly absorbing moisture, watercore results. These conditions are induced by excessive irrigation and by defoliation due to excessive pruning or other causes. *S. E. W.*

Basic Slags and Mineral Phosphates. The Ratio—Soluble Phosphoric Acid: Total Phosphoric Acid. By E. Vanstone (*Jour. of Agr. Sci.* vol. xv. Pt. 1, Jan. 1925, pp. 36-46).—An account of an investigation into the relationship between phosphate soluble in 2 per cent. citric acid and total phosphate present. Three basic slags of widely differing citric solubility were examined, and it was found that the citric solubility was a definite constant independent of the weight taken in the test, when allowance was made for a small constant error in the determination. The ratio soluble phosphate: total phosphate in the case of the mineral phosphates Gafsa, Ephos, Nauru and a West Indian phosphate was found to depend on the weight taken in the test. Experiments with beans are described, and it is shown that the intake of phosphoric acid from basic slags is directly proportional to the citric solubility of the phosphate.—*A. S.*

Bean Disease, Effect of Moisture on a Seed-borne. By L. T. Leonard (*Jour. Agr. Res.* vol. xxviii. No. 5, May 1924, pp. 489-497).—Distinction is drawn between the bean wilt disease caused by *Bacillus flaccumfaciens* Hedges and the bean blight disease caused by *B. phaseoli* Ern. Smith. In the experiments the author found a general tendency toward reduced crops of beans to be due to moisture to seed, harbouring *B. flaccumfaciens*, prior to planting. It is suggested that dry soil as inoculating material will obviate the necessity for moistening the seed for the purpose of introducing *B. radicola*, but clean seed would be even more desirable.

A short bibliography is appended.—A. B.

Beet Sugar, "Curly Top" Disease of the. By E. Carsner and C. F. Stahl. (*Jour. Agr. Res.* vol. xxviii. No. 4, April 1924, pp. 297-320; 5 plates).—"Curly Top" disease of beets is characterized by a dwarfing of the whole plant, curling of the leaves, and swelling of the veins on the under-side of the leaves. Marked phloem necrosis is produced and show as conspicuous dark rings in cross-sections of the roots. The exact nature of the disease is unknown, but the virus can be transmitted by beet leaf hopper (*Eutettix tenella* Baker). No other means is yet known. Plants placed in darkness are more readily infected through the cotyledons than through the true leaves. The virus may be distributed in all parts of the plant. The incubation period varies usually from 7 to 14 days, but is retarded by low temperatures. Very young plants are more susceptible than older ones, and a wide range of species has been found to be susceptible to this disease. It is hoped that a resistant strain of beets may be developed.

A bibliography is appended.—A. B.

Begonia trullaefolia. By A. Guillaumin (*Rev. Hort.* 1924, p. 53; 1 fig.).—*Begonia trullaefolia* was raised from seed collected in Madagascar by Perrier de la Bastie. This perennial has pale green leaves with white veins. The edges of the leaves turn up, forming a hollow receptacle. The flowers are borne in sprays on long stems coloured red or green, streaked with white. The sepals are pale pink. Male and female flowers do not occur on the same stem, although they are produced by the same plant.—S. E. W.

Black Currants, Reversion Disease of, Means of Infection. By A. H. Lees (*Ann. App. Biol.* 12, p. 199, May 1925, 1 fig., 4 plates).—This paper is a continuation of previous work on "Reversion Disease of Black Currants," and deals more especially with the possible means of infection. To test whether the disease could be propagated, trials of grafting diseased scions on healthy stocks were made, and from the sixteen grafted plants under observation the author suggests the following conclusions:

1. That reversion can be propagated by contact.
2. That it is therefore an organic and not a functional disease.
3. That since no organism has been found after many attempts, the disease probably belongs to the class of virus diseases.
4. That it is propagated slowly from the point of infection downwards, thereby infecting shoots arising lower than the point of infection.
5. That the rate of propagation and the intensity of the attack depends directly on the intensity of the original infection:
6. That its propagation *can* be quite independent of the presence of the black-currant mite.

The season of 1924 was remarkable for the large increase in the number of fresh cases of reversion. Statistical investigation of the disease, continued on a plantation of 547 bushes comprised of Hatton's four main groups, showed a percentage increase of approximately 7 per cent. in Baldwin (Strain 1), 9 per cent. in Edina, 11 per cent. in Seabrook's Black, 13 per cent. in Boskoop Giant, and 23 per cent. in Baldwin (Strain 11). From observations made the following main conclusions are drawn with regard to these new infections:

1. Infection with the disease may vary in severity between wide limits.
2. There is no evidence of occurrence of the disease solely on the ground of proximity of healthy and infected plants.
3. The possibility of infection by contact with diseased material during the process of pruning is suggested.
4. There is some evidence in support of the possibility of a pest carrier.
5. Hard pruning with lime-sulphur spraying had a considerable control influence.

There is as yet no direct proof that pests carry the disease, but it will be the aim of future experiments to test whether mite, capsids, or aphides may not be carriers.—G. F. W

Cabbage Black Leg. By W. A. Birmingham (*Agr. Gaz. N.S.W.* vol. xxxv. pp. 901-903; 2 figs.).—The fungus *Phoma lingham* is the cause of Black Leg in cabbage, cauliflower and related plants. To guard against it use disease-free seed or seed sterilized by immersion in 0.1 per cent. solution of mercuric chloride. If there is any chance of infection in the seed bed, sterilize the soil by three applications of the mercuric chloride solution. Irrigating the seed bed is preferable to overhead watering. Infected land must not be planted with cabbage or cauliflower or similar vegetables for two years.—S. E. W.

Candidea stenostegia Stapf (*Bot. Mag.* t. 8981; Nov. 1923).—A perennial herbaceous composite with reddish flowers, needing stove treatment, flowering in winter, native of tropical Africa.—F. J. C.

Caralluma Pseudo-N. E. Brownii Dinter (*Bot. Mag.* t. 8982; Nov. 1923).—A succulent native of S.W. Africa with a name which ought never to have been coined. Flowers in umbels, brownish red.—F. J. C.

Catalytic Fertilizers. By G. Bellair (*Rev. Hort.* 1924, pp. 27, 28).—Minute quantities of the sulphates of zinc and manganese accelerate the absorption of nitrogen, potash and phosphate by plants and aid their development. The rapid growth of seedlings is assured by watering them with an aqueous solution containing one part by weight of zinc sulphate and manganese sulphate per million.—S. E. W.

Cauliflower Brown Rot and Alternaria Leaf Spot. By J. L. Weimer (*U.S. Jour. Agr. Res.* vol. xxix. No. 9, Nov. 1924, pp. 421-442; 4 plates).—The leaf spot of the cauliflower caused by *Alternaria brassicae* has been studied, the pathogenicity of the organism established, and the symptoms produced on plants of different ages and under different conditions described. A brown rot is also produced by this organism in the "head" of the cauliflower. The fungus has an optimum temperature for spore germination of 33° C. to 35° C.; for mycelium development on potato agar between 25° C. to 27° C. The maximum temperature for infection of detached cauliflower leaves artificially inoculated and grown under moist conditions was 36° C.

The disease takes about 19 days to develop. Although little actual decay is caused in 2 weeks below 10° C., the commercial value is affected. The amount of infection and the rate of development increases as the humidity of the air increases. The fungus produces invertase and amylase, but not pectinase or cytase, when grown upon sweet potato and cabbage decoctions. Suggestions are made for control. A short bibliography is appended.—A. B.

Celery Blight (*Cercospora apii* Fres.).—By L. J. Klotz (*U.S. Exp. Stn. Michigan Tech. Bull.* No. 63, Nov. 1923, pp. 1-42, 9 plates).—The early blight of the celery (*Cercospora apii* Fres.) is commonly found in plants in Europe and America. It appears as sub-orbicular spots on the leaves. The fungus enters through the stomata and grows intercellularly by haustoria. Conidia are borne externally. The fungus grows readily on all media and spores can germinate in range of p. H 4.6 to p. H 8.0 in some solutions. The temperature most suitable for its growth is 25° C. to 30° C. The mycelium can survive fourteen months desiccation and may be anaerobic under certain conditions. There was no variety found to be immune to the early blight. Control therefore is a matter of careful cultivation, avoiding excessive moisture. A full bibliography is appended.—A. B.

Cherries in New South Wales. By W. H. Brown (*Agr. Gaz. N.S.W.* vol. xxxvi. pp. 121-134 and 199-208; 5 figs.).—Kentish stock is recommended for heavy and Mazzard for light soils. Florence, St. Margaret, Noble, Black Republican and Biggareau Pellissies thrive on Kentish stock, and Early Lyons, Eagle seedling and Bedford Prolific do best on Mazzard. Early Purple Guigne is always grown on Mahaleb. The stock is raised from suckers. The importance of cross-fertilization must not be overlooked, e.g., Early Lyons yields heavier crops if planted in the vicinity of Early Purple Guigne. St. Margaret and Florence should be planted together. Poorly drained soil and excessive moisture encourage gumming. Scoring or scarring the bark is held to be a remedy for this evil and also for sour sap. San José Scale is the most serious insect pest, but it can be kept in check by spraying with miscible oils or lime sulphur.—S. E. W.

Cherry and Prune Brown Rot in the Pacific North-West. By Charles Brookes and D. F. Fisher (*U.S. Dep. Agr. Bull.* No. 1252, July 1924, pp. 1-21; 5 plates).—The investigations here detailed extend over five years on the brown rot of prunes and cherries grown in the lower Columbia and Willamette Valleys of Washington and Oregon. No evidence was found that the disease was carried by cankers or mummified fruits over the winter. Apothecia were abundant

in uncultivated prune orchards and were found within five inches of the surface soil. Blossom infection always occurs on both prunes and cherries, sometimes destroying one-third to one-half of the young fruit. Lime sulphur and occasionally Bordeaux mixture caused injury and often resulted in small-sized cherries. During the experiments there was never any epidemic of brown rot in the orchards, but considerable losses were reported from neighbouring unsprayed orchards. All the various standard sprays were found to be fairly efficient in checking the disease. Storing and transport tests showed that orchard spraying aids considerably in improving the keeping quality of fruit, even when the amount of the disease in the orchard is practically negligible.—*A. B.*

Citrus Nursery Methods. By O. Brooks (*Agr. Gaz. N.S.W.* vol. xxxv. pp. 515-520; 1 fig.).—Seedling stocks for citrus are raised from the seed of the common lemon or the sour orange, sown on well drained friable soil to which a little sand and manure are added. The seed is covered with soil to the depth of one inch, and the seedlings are shaded from direct sunlight. The year-old seedlings are planted out in rows, three feet apart, with a space of eight inches between the plants. The soil is prepared by lightly working the surface only; this discourages the formation of tap roots. When transplanting, spread out the roots carefully, avoiding twists and kinks. A light dressing of bone meal helps to keep the roots near the surface. Well-matured wood is used for budding; this is selected from good bearers. The bud is inserted 2-3 inches above ground level. When the bud begins to shoot the stock is cut back and staked. Disbudding is carried out regularly. When the tree is removed to the orchard as much as possible of the fibrous root is lifted.—*S. E. W.*

Combination Sprays. By R. W. Thatcher and L. R. Streeter (*Proc. New York State Hort. Soc.*, 69th Ann. Meeting, 1924, pp. 51-56 and 88-95).—A digest of laboratory experiments to discover the best method of mixing lead arsenate and lime-sulphur washes. The undesirable action between these two washes can be effectively overcome by the addition of some form of casein.

Besides the spreading effect of casein preparations, there is the additional advantage of preventing chemical reactions.

The effective strengths were 4 oz. of pure casein to 100 gallons of wash. A proprietary brand of casein "Kayso" gave similar effective results at a strength of $\frac{1}{2}$ lb. to 100 gallons of the mixture.—*G. F. W.*

Contact Insecticides, Studies on. By F. Tattersfield, C. T. Gimingham, and H. M. Morris (*Ann. App. Biol.* vol. xii. No. 1, Feb. 1925, pp. 61-76).—The paper is divided into two parts, viz.:—(I) introduction and methods, and (II) a quantitative examination of the toxicity of *Tephrosia vogelii* Hook. to *Aphis rumicis* L. (the bean aphid).

Part I. forms a general introduction as to the methods used and the mode of expressing results obtained from using various (a) plant products and (b) artificial and synthetic derivatives.

Part II. deals with the insecticidal properties of the plant *Tephrosia vogelii*, which showed great promise as a contact insecticide and resembles *Derris* in being extremely toxic to fish.

The various species of *Tephrosia* are given and the toxic principles of *T. vogelii* are given in detail.

The results obtained by using aqueous and alcoholic extractions of the leaves, stems, and seeds against the bean aphid are given in tabulated form.

Both aqueous and alcoholic extracts of leaves and seeds were found to have a high toxicity as a contact poison to *Aphis rumicis*, and concentrated extracts gave as efficient results as when nicotine was used. Extracts of the stems have not proved so toxic.—*G. F. W.*

Control of Certain Maggots attacking the Roots of Vegetables, Further Experiments in the. By K. M. Smith (*Ann. App. Biol.* vol. xii. No. 1, Feb. 1925, pp. 77-92).—The insects concerned in the trials were the onion fly (*Hylemyia antiqua* Meig.); carrot fly (*Psila rosae* Fabr.); cabbage root fly (*Chorophila brassicae* Bouche); and turnip gall weevil (*Ceuthorrhynchus pleurostigma* Marsh.).

Each pest is dealt with separately and short descriptions of the adults and general life-history are given.

Control experiments against the first two pests have been carried on since 1920.

There is a list of the chemicals used in the trials, and the results of treated and control plots are given in tabulated form.

The recommendations are (1) against onion fly—nicotine sulphate dust in a 5 per cent. or chlor-cresylic acid in a 1 per cent. mixture, both in precipitated chalk; (2) against carrot fly—nicotine sulphate dust as advised above or creosote

in a 1 per cent. mixture with precipitated chalk; (3) against cabbage root fly—the most successful were (a) chlor-cresylic acid, 1 per cent., (b) green tar oil, 1 per cent., and (c) creosote, 1 per cent. mixtures, all in precipitated chalk; (4) in the case of the turnip gall weevil, it was found that, given good cultural conditions at the time of setting out, the affected plants will flourish normally. The critical time in the life of a galled cabbage is the seedling stage. There is an apparent attraction of the galls for slugs.—G. F. W.

Cucumber Mosaic Disease. By S. P. Doolittle (*U.S. Dept. Agr. Circ.* No. 321, July 1924, pp. 1-6; 2 plates).—Cucumber Mosaic disease is one of the most difficult diseases to control in the greenhouse. It attacks the squash, pumpkin, and musk-melon, as well as the cucumber. The symptoms first appear upon the young leaves, which become mottled with patches of yellowish green. The leaves often show slight curling at the tip or along one side. Soon the whole surface becomes yellow and withers. The fruits show also characteristic lesions and become mottled and warty in appearance. Mosaic disease spreads with much rapidity and the entire bed may be completely destroyed in a short time.

Numerous trials for efficient control measures were made, including the destruction of the carrying insects (*Aphis gossypii* Glover) and the striped cucumber beetle (*Diabrotica vittata* Fabre) by fumigation with tobacco dust or cyanide fumigation.—A. B.

Currant and Apple Rot caused by *Physalospora* and *Botryosphaeria*. By C. L. Shear, N. E. Stevens, and M. S. Wilcox (*Jour. Agr. Res.* vol. xxviii. No. 6, May 1924, pp. 589-602; 2 plates).—The life-histories of *Botryosphaeria ribis* (causing cane blight in currants) and *Physalospora malorum* (causing black-rot of apples) have been repeatedly verified by the development of pycnospores from single ascospores in pure cultures. The chief differences lie in that *Botryosphaeria* has *Dothiorella* as its pycnidial stage, while *Physalospora* has *Sphaeropsis* as its pycnidial stage; also in the differences in size of the ascospores. The apple fungus *B. mali* Putterill is apparently identical with the physiological variety of *B. ribis* G. and D. which the writers call *chromogena*.

A short bibliography is given.—A. B.

Currant Disease (*Physalospora malorum*). By N. E. Stevens (*Jour. Agr. Res.* vol. xxviii. No. 6, May 1924, pp. 583-588; 2 plates).—The perfect stage of the *Sphaeropsis* common on dead currant canes has been demonstrated to be a *Physalospora* which is identical with *P. malorum* (the blackrot disease of the apple). The chief difference in the fungus on the two hosts is in the size of the sporocarps, which are larger on the currant than on the apple. Pycnidia, produced on sterile apple twigs from pure cultures of the currant fungus, are small, but similar cultures of the apple fungus are large and usually contain many spore cavities. This fact is of pathological interest and may be of value in the control of the disease.—A. B.

Cyclamen balearicum Willk. (*Bot. Mag.* t. 8989; Nov. 1923).—Common in Mallorca, this is rare in cultivation. Leaves about 1½ inch in diameter, dark green above, purplish beneath; flowers produced in February, small, whitish with pink suffusion.—F. J. C.

Delphinium, Bacterial Leaf-Spot of the. By Mary K. Bryan (*Jour. Agr. Res.* vol. xxviii. No. 3, April 1924, pp. 261-270; 4 plates).—The black spot of the Delphinium is a bacterial disease widespread in the northern part of the United States and is very destructive to choice hybrid varieties.

The causal bacterium has been isolated and successful infections obtained by spraying with water suspensions of young sub-cultures from single colonies. The bacterium gains entrance to the plant through the water pores and stomata and causes black tarry spots on the leaves and sometimes upon the stems and flowers.

The characteristics of this bacterium are as follows: short rod form with rounded ends with 1 to 6 bipolar flagella; capsules, aerobis, white, producing blue-green fluorescence in cultures; liquefies gelatine, does not reduce nitrates, clears milk without coagulation, produces ammonia, forms acid from dextrose, galactose, levulose, but not from lactose, maltose, glycerine, or mannite: not acid fast; gram negative; stains readily with carbol fuchsin and gentian violet; is pathogenic to Delphiniums. The name *Bacterium delphinii* E. F. S. is suggested for this organism.—A. B.

Disease in Potatoes, A Preliminary Study of the Relationship between Manuring and Susceptibility to. By H. W. Miles and B. Thomas (*Jour. of Agr. Sci.* vol. xv. Pt. 1, Jan. 1925, pp. 89-95).—An account of experiments conducted at the Kirtton Agricultural Institute, Lincolnshire. The principal diseases present

were leaf curl and mosaic and those caused by *Rhizoctonia solani*, *Colletotrichum tabificum*, and *Phytophthora infestans*. The plants were grouped as (a) healthy plants, (b) plants infested with potato blight, and (c) plants infested with other diseases. On plots which received a basal dressing of 4 cwt. 30 per cent. superphosphate and 2 cwt. sulphate of potash to the acre, a dressing of more than $3\frac{1}{2}$ cwt. sulphate of ammonia increased the amount of disease. On plots where a well-balanced compound manure was applied in increasing quantities the highest percentage of healthy plants occurred where the heaviest dressing was used, although that dressing supplied more than $3\frac{1}{2}$ cwt. sulphate of ammonia to the acre. On plots which received a basal dressing of 4 cwt. 30 per cent. superphosphate and $2\frac{1}{2}$ cwt. sulphate of ammonia, varying amounts of sulphate of potash were applied, and the resistance to disease rose with the amount of potash used, the best result being given by the heaviest dressing of sulphate of potash, viz., 2 cwt. to the acre. In a similar series where different potash manures were used at rates equivalent to 2 cwt. of sulphate of potash to the acre it was found that sylvinitic and 20 per cent. potash salts were much less efficient than sulphate or muriatic potash. Superphosphate was found to increase susceptibility to disease, and this is thought by the authors to be due to a disturbance in the balance of plant foods in this particular soil resulting from the continued use of heavy dressings of phosphatic manures during the past thirty years.—A. S.

Egg-killing Washes. By A. H. Lees (*Jour. Pomol.* vol. iv. No. 2, Jan. 1925, pp. 104-112).—An investigation as to the efficacy of lime-sulphur, tar distillates and cresylic acid mixtures on the eggs of the permanent apple aphid, *Aphis pomi*.

The plants used were ungrafted stocks of Malling Paradise type II. (Doucin), and type V. (Improved Doucin), and in every case the eggs laid on the former proved more viable than those on the latter stock.

Lime sulphur used at varying strengths (1-15, 1-20 and 1-30) both with and without calcium caseinate "spreader" proved unreliable as egg destroyers.

Tar distillate washes gave good results. All the washes used were of a proprietary nature, and not every such material, though indistinguishable by the eye, had definite egg-killing properties.

Commercial cresylic acid, used either as a wet spray with soap or dry with a carrier, failed to show egg-killing power.

The results are set out in a series of five tables.—G. F. W.

Fatschedera Lizei. By F. Lesourd (*Rev. Hort.* 1924, pp. 179, 180; 1 fig.).—*Fatschedera Lizei*, formerly known as *Aralia Lizei*, was described in *Rev. Hort.* (1912, p. 568). This decorative hardy shrub appears to be a hybrid of *Fatsia japonica* Moseri and *Hedera Helix hibernica*.—S. E. W.

Fern Mite, The (*Tarsonemus tepidarium* Warburton). By W. P. Legerwood Cameron (*Ann. App. Biol.* vol. xii. No. 1, Feb. 1925, pp. 93-112; 5 figs., 3 plates).—An investigation as to the cause of "Fern Mite Disease" occurring on *Asplenium bulbiferum* and its varieties.

The egg, larval and adult stages are described and figured, and the habits and life-history are dealt with.

The symptoms of attack are minute depressions, which later turn brown, on the leaves, giving the plants a speckled appearance. The pinnae become distorted, the fronds asymmetrical, and the plants dwarfed. Badly attacked plants are unsaleable, and ultimately die. The most serious injury is done to the young fronds, the old ones being immune.

A review of the economic species of *Tarsonemus* are given, together with their host plants.

This pest is spread by (1) introducing infested plants, (2) the mites crawling from leaf to leaf where they touch, and (3) by planting young "pips" taken from infested parents.

Preventive measures include the planting of clean stock, destruction of badly infested plants, sterilization of houses, proper ventilation, adequate drainage, the correct degree of temperature and humidity, the application of potash manures together with the sparing use of nitrogenous manures, and the rotation of greenhouse crops.

A bibliography of forty-five references is given.—G. F. W.

Fruit Stone, Two New Diseases of. By C. C. Lindegren and D. H. Rose (*Jour. Agr. Res.* vol. xxviii. No. 6, May 1924, pp. 603-605).—There has been found on peaches grown in California a rot similar to *Botrytis cinerea*. It is proved by inoculation and re-isolation that this fungus is the cause of the disease. The inoculation experiments indicate that the fungus is able to penetrate the uninjured skin of the fruit.

From sweet cherries in Michigan a rot fungus, a species of *Alternaria*, has been isolated. There is no proof that the *Alternaria* from sour cherries is identical with that from sweet cherries, but cross inoculation and re-isolation have shown that both strains are pathogenic to both kinds of cherries. It appears that the fungus is unable to penetrate the uninjured skin of the fruit.—A. B.

Fruits, "Brown Rot" of, in America. By J. W. Roberts and J. S. Dunegan (*Jour. Agr. Res.* vol. xxviii. No. 9, May 1924, pp. 955-960).—The common "Brown Rot" fungus in America has been given at various times the following names: *Oidium fructigenum*, *Monilia fructigena*, *Sclerotinia fructigena*, *S. fructicola*, *S. cinerea*, *S. americana*.

The known differences between the forms are chiefly physiological, as shown by differences of growth on artificial media. It is shown that the American variety shows the characteristics of ascogenous formation of *Sclerotinia fructicola*, but known differences are not sufficiently great to warrant considering the two forms as separate species. The name *Sclerotinia cinerea* (Bon) Schröt is preferred by the authors.

A short bibliography is appended.—A. B.

Fumigation of Bean Weevils, *Bruchus obtectus* Say. and *B. quadrimaculatus* Fab. By A. O. Larson (*Jour. Agr. Res.* vol. xxviii. No. 4, April 26, 1924, pp. 347-356).—The causes of inefficient results due to fumigation for bean beetles are due to the following causes:—(1) the use of sheds or rooms which are far from being gas-tight; (2) the use of inferior grades of carbon bisulphide; (3) too low temperature; and (4) too short an exposure.

By using efficient chemicals of either carbon bisulphide or hydrocyanic-acid gas in a gas-tight chamber at a sufficiently high temperature it is entirely possible with one fumigation to kill all the beetles in all their stages, both within and among the seeds.

Small quantities of seeds may be efficiently fumigated with a minimum dose of 3 lb. carbon bisulphide per 1,000 cubic feet, at a temperature of 58° F. or higher for 24 hours, or 1½ lb. for 48 hours. Liquefied hydrocyanic-acid (2 lb. for 48 hours at 70° F. or higher, or 1·3 lb. for 90 hours) and hydrocyanic-acid gas (generated from 3·4 lb. of sodium cyanide at 70° F. for 48 hours, or 1·8 lb. for 90 hours) may be used with equal efficiency.

Large quantities require either a longer exposure or, better, a greater quantity of the fumigant.

The perupal stage, which is found deepest in the seeds, is more resistant to fumigation than any other stage of the life-history.

The results are set forth in eight tables.—G. F. W.

***Gastrochis Humblotii*.** By E. Francais (*Rev. Hort.* 1924, pp. 106-107; 1 fig.).—This beautiful Madagascar Orchid, formerly described as *Phajus Humblotii*, is now known as *Gastrochis Humblotii*. It flowers regularly in February and is easily grown. The pseudo-bulbs are not injured by the journey from Antananarivo, Madagascar. They thrive in a compost containing 75 per cent. manure in a temperate house.—S. E. W.

Geranium Stem Rot Caused by *Pythium completeans*, n.sp. By H. Brawn (*U.S. Jour. Agr. Res.* vol. xxix. No. 8, Oct. 1924, pp. 399-420; 5 plates).—The disease consists of a progressive basal blackening of the stem of *Pelargonium* cuttings, accompanied by a soft rot of pith and cortex. The infection stops 20 to 40 mm. from the base in 6 to 8 days. This is due to a host-resistance reaction shown by the formation of a cork cambium completely across and within the stem, barring further infection by the hyphae of the fungus. Starch disappears from healthy cells in the cortex and pith. The hyphae are hyaline, coenocytic, and cylindrical with rounded tips. Sporangia are abundant and are oval or spherical. Fertilization takes place by direct passage of the anthecidial contents. Comparison with *Pythium de Baryanum* is given.—A. B.

Gladioli Corm Disease Caused by *Bacterium Marginatum*. By L. McCulloch (*U.S. Jour. Agr. Res.* vol. xxix. No. 4, Aug. 1924, pp. 159-178; 5 plates).—This bacterial disease of Gladioli probably occurs wherever these plants are grown. The description and method of isolating the bacterium have already been published (in 1921). The injury to the Gladioli varies. If the leaves are attacked reddish spots are found abundantly. The parenchyma is first destroyed and the vessels are unable to supply moisture to the leaf, which becomes brown and dry. Infected corms are more or less disfigured by circular shallow depressions, brown in colour, horny or brittle in texture and exuding a gummy substance. The spots finally become black and destroy the corms. Isolations have been made from lesions on leaves, stems, corms, and from the exudates. The organism grows

best at 25° C. to 30° C. There is evidence that this organism remains alive in the soil which has become infected. Control measures include treatment of the corms with either mercuric chloride (1 in 1000) or formalin (1 in 80).—A. B.

Gloxinia Hybrids. By A. Petit (*Rev. Hort.* 1924, pp. 193-195).—The best soil for the growth of Gloxinias is peat mixed with one-third of its bulk of garden soil containing about 1·3 per cent. of calcium carbonate.—S. E. W.

Grapes. By Y. Oinoue (*Rev. Hort.* 1924, pp. 271, 272).—When grapes are grown in the open, the best conditions for fertilization are obtained by protecting the grapes from sudden changes of temperature by covering them with paper bags before flowering.—S. E. W.

Greenhouse Insects. By E. J. McDaniel (*Michigan Agr. Exp. Stat., Bull.* 134, June 1924, pp. 3-75; 41 figs.).—This bulletin deals with the principal pests of plants growing under glass, together with remedial measures.

The first part deals with control measures, e.g. contact washes (nicotine, lemon oil, kerosene and linseed oil emulsions and pyrethrum); stomach poisons (Paris green, arsenates of lead and calcium and arsenic); poison baits and fumigants (hydrocyanic-acid gas, nicotine and sulphur); soil sterilization and plant hygiene.

The pests dealt with include many British species, chief amongst which are millipedes, slugs, wood-lice, root and stem eelworms, red spider, bulb and cyclamen mites, thrips, tarnished plant bug, aphides, white flies, scale insects and mealy bugs, surface caterpillars, diamond-back moth, chrysanthemum leaf-miner, vine weevil, larvae of chafers and click beetles, violet sawfly and Cattleya fly.

Concise descriptions are given of the several stages and life-histories and full notes on control measures.—G. F. W.

Greenhouse Plants, Insects Injurious to Ornamental. By C. A. Weigel and E. R. Sasser (*U.S.A. Dept. Agr., Farmer's Bull.* No. 1362, pp. 1-80; 91 figs.).—A popular bulletin dealing with such questions as how the various pests spread and how insects feed; insecticides and fumigants, together with their formulæ; spraying and dusting apparatus. This last section is profusely illustrated and the various types of spraying machinery and nozzles are explained and figured.

The pests, amongst which are many British species, are arranged under their host plants, which are in alphabetical order. Each pest is described in a few lines. The symptoms of attack, life-history, and control measures are more fully dealt with.—G. F. W.

Hard Water and Peat Lovers. By A. Petit (*Rev. Hort.* 1924, pp. 54, 55).—Plants grown in a peaty soil yield better results when supplied with hard water, as this tends to neutralize the acidity of the peat.—S. E. W.

Heating of Grain caused by Insects, Effect of Fumigation upon. By E. A. Back and R. T. Cotton (*Jour. Agr. Res.* vol. xxviii. No. 11, June 14, 1924, pp. 1103-1116).—Whereas wheat showing a moisture content of less than 14·5 per cent. is likely to remain in condition if properly stored and kept free from insect pests, it was found that when seed-living insects were present the grain has been known to heat when the moisture content is as low as 12 per cent.

The heating of grain and chick-peas has been shown to be entirely caused by certain grain-feeding insects, e.g. *Sitophilus oryzae*, *Cryptolestes pusillus*, and *Bruchus quadrimaculatus*.

Fumigation either by means of carbon bisulphide or hydrocyanic-acid gas prevents unnatural heating and permits the grain to return to normal temperature.

The authors, by means of six tables, show the results on which their conclusions are based.—G. F. W.

Humification of Soil Organic Matter, A Method for Determining the Degree of. By G. W. Robinson and J. O. Jones (*Jour. of Agr. Sci.*, vol. xv. Pt. 1, Jan. 1925, pp. 26-29).—An account of an investigation of the action of hydrogen peroxide, treatment with which is proposed as the basis of a method for estimating the approximate degree of humification of soil organic matter. Hydrogen peroxide oxidizes or renders soluble a portion of the organic matter of soils. It appears to be without action on fibrous organic substances such as cellulose and lignins. Humified material seems to be oxidized completely or brought into a water-soluble state.—A. S.

Hydrangeas. By H. Cayeux (*Rev. Hort.* 1924, pp. 266-268; 6 figs.).—New varieties of Hydrangeas are raised by cross fertilization. Hydrangeas bear large sterile flowers and small fertile flowers which are found at the base of the

pedicle bearing the sterile buds. In order to effect pollination, the stamens must be carefully removed three or four days before fertilization with the pollen of the other plant. The influence of the male parent on the offspring is very marked. The ripe seeds are sown in a peaty soil under glass in March or April.—S. E. W.

Hydrangeas, Blue-flowered. By A. Petit (*Rev. Hort.* 1924, p. 246).—To ensure that the flowers of *Souvenir de Claire* and similar varieties of *Hydrangea* shall exhibit the popular blue colour, water the plants seven or eight times with a 2-2½ per cent. solution of aluminium sulphate.—S. E. W.

Hydrocyanic-acid Gas in the Protection of Chick-peas (*Cicer arietinum*) Warehoused in 240-pound Sacks, Effective Use of. By E. A. Back and R. T. Cotton (*Jour. Agr. Res.* vol. xxviii. No. 7, May 17, 1924, pp. 649-660; 1 plate).—The storage of wheat, corn, rice, animal feeds, flour, etc., in bins, grain elevators, or stacked closely in sacks in warehouses, can be successfully protected from the attacks of seed-infesting beetles, e.g. *Bruchus quadrimaculatus*, *Rhizopertha dominica*, *Lasioderma serricornis*, and *Plodia interpunctella*, by the use of hydrocyanic-acid gas. This gas is to be preferred to highly inflammable and explosive gases, especially in congested districts.

The effective amount was 2½ lb. of sodium cyanide (98-99 per cent.) per 1,000 cubic feet of space. This quantity was sufficient to protect chick-peas when stored in 240-lb. sacks no matter whether these were stacked 4 or 5 feet deep or in piles, the tiers of which were often 18 sacks high.—G. F. W.

Insecticidal Effect of Cold Storage on Bean Weevils By H. O. Larson and Perez Simmons (*Jour. Agr. Res.* vol. xxvii. No. 2, Jan. 12, 1924, pp. 99-105).—A report on the insecticidal efficiency of certain commercial cold-storage temperatures upon *Bruchus obtectus* Say. and *B. quadrimaculatus* Fab. The scope and method of working the temperatures are described, together with the effect of low degrees on the eggs, larvæ, pupæ, and unemerged adults. The results are set down in five tables. Successful results were obtained by subjecting Californian pink beans, containing all stages of *Bruchus obtectus*, to a temperature of 32° F. for 56 days or 36° F. for 66 days. When shorter periods were tested, it was found that the surviving adults were incapable of reproduction.

Against *B. quadrimaculatus* in black-eye cowpeas, a temperature of 32° F. for 32 days was sufficient to kill all stages. The eggs were more susceptible to cold than the other stages and were killed by four days' refrigeration at 32° F. or 20° F., but a longer exposure was necessary to kill them at 39° F.—G. F. W.

Laelocattleya Deschanelii var. Marcelliana. By V. Lecouffe (*Rev. Hort.* 1924, pp. 160, 161; 1 col. plate).—A beautiful hybrid from *Cattleya Trianae* and *L.-c. Callistoglossa*, as may be seen from the coloured plate.—S. E. W.

Legumes, Mycorrhizal Fungus on the Roots of. By F. R. Jones (*U.S. Jour. Agr. Res.*, vol. xxix. No. 9, Nov. 1924, pp. 459-470; 2 plates).—A mycorrhizal fungus has been found in the primary cortex of the roots of peas, alfalfa, clover, and other legumes. The mycelium is coarse, non-septate in the roots, and is largely intercellular in the deeper tissues. It produces haustoria often of a complex nature, filling more than half the lumen of the cells, the contents of which become greenish yellow, thus giving a characteristic discoloration to the entire root. The fungus appears to be one of the Phycomyces. It cannot yet be cultivated on artificial media. Plants are generally attacked in the autumn of the year. The fungus is able to invade roots of peas and sweet peas at a soil temperature of 33° C. and even as low as 9° C. This mycorrhizal fungus is found on *Allium Cepa* L., *Asparagus officinalis*, *Aster* spp., *Bidens vulgata* Greene; *Eupatorium perfoliatum* L., *Fragaria virginiana* Duch., *Ipomoea purpurea* L., *Panicum capillare* L., *Taraxacum officinale* Web., *Viola* spp.; *Zea Mays* L., *Verbascum Thapsus* L., as well as the several genera of Leguminosæ.—A. B.

Maxillaria chrysantha Barb. Rodr. (*Bot. Mag.* t. 8979; Nov. 1923).—Native of Brazil. An epiphyte with yellow flowers about 2 inches in diameter, sweet-scented and long-lasting. Requires an intermediate house.—F. J. C.

Nitrogenous Manures. By A. Petit (*Rev. Hort.* 1924, pp. 156, 157).—Experiments with cuttings of *Abutilon Thompsoni* grown in six-inch pots make the maximum growth when supplied with two grams of sodium nitrate, but the most decorative effect is obtained by the addition of four grams of sodium nitrate as the increased dose makes the tints more vivid.—S. E. W.

Onion, Bulb Rot Fusarium of the. By J. C. Walker and E. C. Tims (*Jour. Agr. Res.* vol. xxviii. No. 7, May, 1924, pp. 683-694; 3 plates).—Fusarium bulb rot of the onion is a disease of great importance in the United States. The present paper is a study of the causal organism, *Fusarium cepae* Han., as

found in the Middle Western States, and its morphological and cultural characteristics are recorded as follows. On potato agar the fungus grows over a range from 4° C. to 35° C., with optimum growth at 25° C. to 28° C. On Richard's solution the fungus grows over a range in P_H from 2.2 to 8.4. Best growth is at P_H 6.6. Inoculations were readily secured through wounds in plants growing from sets in greenhouses. In controlled soil temperature experiments the disease developed within limits of 15° C. to 32° C. Most rapid development occurred at 28° C. to 32° C. The disease cannot develop at 12° C.

As a storage disease the bulb rot is most active at above room temperature. At 30° C. the tissues decay and desiccate rapidly. At 20° C. the decay is rapid, but the tissue remains watery for a longer time. At 15° C. the decay is very slow, but premature sprouting takes place, while at 8° C. the rot is very slight. Thus at this low temperature the indirect effects of the disease may cause heavy losses in storage or transit.

A bibliography is appended.—A. B.

Onion Scale Pigmentation and Disease Resistance. By J. C. Walker and C. C. Lindegren (*U.S. Jour. Agr. Res.* vol. xxix. No. 10, Nov. 1925, pp. 507-514).—The marked resistance of coloured types of onions to smudge disease (*Colletotrichum circinans*) is due to the presence in the outer scales of certain toxic substances closely associated with the pigment compounds. The functioning of this resistant principle depends upon the easily diffusibility of these toxins from the dead outer scales into drops of soil water where they are rendered innocuous to the plant. The present paper was to determine the effects of these soluble toxins on certain other fungi which attack the onion bulbs. The fungi considered were *Fusarium cepae* (Han.) and *F. n. sp.*; also *F. lycopersici*; *F. graminearum*; *Aspergillus niger*; *Helminthosporium sp.* and *Botrytis allii*.

With one exception (*A. niger*), the organisms germinated and developed in extracts of the white outer scales as well as in the extracts from the white inner scales; but when extracts from dry outer coloured scales were used germination and growth of the organisms were greatly retarded, if not entirely inhibited.

Fusaria which enter through wounds do not come in contact with the soluble toxins in the outer scales. *Helminthosporium sp.*, which is sensitive to the toxins, is evidently limited to the outer scales of white varieties. *Botrytis* enters the succulent tissues through premature topping at harvest time. A short bibliography is appended.—A. B.

Pear Late. By R. Barbier (*Rev. Hort.* 1924, p. 83; 1 fig.).—Beurré d'Avril is recommended as a good late pear, maturing between the end of March and April, sometimes as late as May. The fruit is sweet and juicy, with a fine flavour and pleasant aroma.—S. E. W.

Pear Le Beurré Papa Lafosse. By N. Bruneau (*Rev. Hort.* 1924, p. 108; 1 col. plate).—The new dessert pear Le Beurré Papa Lafosse ripens in September. It is depicted in the coloured plate.—S. E. W.

Pelagodoxa Henryana. By D. Bois (*Rev. Hort.* 1924, pp. 138, 139; 1 fig.).—This remarkable palm is a native of the Marquesas Isles. Only two specimens are believed to exist in Europe. The large fan-shaped leaves, green on the upper surface and silvery white underneath, give it a handsome appearance.—S. E. W.

Pests of Field and Garden Crops, Common. By R. H. Pettit (*Michigan Agr. Exp. Sta., Bull.* 132, March 1924, pp. 3-60; 40 figs.).—The chief insect pests of garden and field plants are described, together with the symptoms of attack and control measures.

Seventeen British species of insects and one species of slug are included in the text.—G. F. W.

Physics of Spray Fluids, The. (II.) The Protective Action of Various Substances on Lead Arsenate Suspensions. By R. Marcus Woodman (*Jour. Pomol.* vol. iv, No. 2, Jan. 1925, pp. 78-94; 2 figs.).—An endeavour to ascertain the best protective agent for use with lead arsenate washes. The various materials tested were soap, dextrin, starch, sodium and calcium caseinates and gelatine, of which the two last-mentioned are advocated.

The use of either gelatine (0.5 per cent.) or calcium caseinate (0.5 per cent.) increases the volume of spray retained by the leaves because of increased viscosity and adsorption effects. Gelatine is insoluble in cold water, which is a disadvantage from the commercial aspect, although a mixed film of gelatine and arsenate once dried on the foliage would not be washed off by rain.

It is desirable that the particles of lead arsenate should be ground finer than is at present found in the paste forms, and the most effective wash would be

obtained by using the paste form with gelatine at 0.2 per cent. concentration.—G. F. W.

Physics of Spray Liquids, The. (III.) On the Ease of Formation of Emulsions. By R. Marcus Woodman (*Jour. Pomol.* vol. iv, No. 2, Jan. 1925, pp. 95-103).—A preliminary paper on the effect of dilute oil emulsions on foliage in order to ascertain some of the more important causes of scorching.

Oil emulsions (especially when concentrated) in water are best made by using the method of intermittent shaking. They are much easier to make at high temperatures and by adding the oil gradually and emulsifying between each addition.

Sodium soaps are much inferior to gelatine and potash soaps as regards the ease by which emulsification takes place.—G. F. W.

Phytolacca clavigera W. W. Sm. (*Bot. Mag. t.* 8978; Nov. 1923).—Somewhat like *P. decandra* (*P. americana*) but with closer racemes of purple-rose flowers with larger perianths. A hardy herbaceous border plant about 4 feet in height from Yunnan.—F. J. C.

Plant Parasitic Nematodes and Related Forms, On Some. By G. Steiner (*Jour. Agr. Res.* vol. xxviii, No. 11, June 14, 1924, pp. 1059-1066; 4 plates).—An account is given of the presence of *Cephalobus subelongatus* Cobb in the leaves and stems of *Phlox Drummondii*. The infested plants were green with only a few brown spots, but dwarfed, less bushy, and with fewer flowers than in previous years. Dr. Cobb has found this species of eelworm on green pepper pods (Philippine Islands), clover seeds (Idaho), lily-of-the-valley roots (Washington), diseased germinating rubber seed (Hawaii), and in the crowns of diseased alfalfa plants (New Jersey and Pennsylvania). A technical description is given of the male form.

This species may be regarded as an omnivorous feeder and well fitted for varied life conditions, and it is expedient that greater attention should be paid to the ability this genus possesses of entering and living in healthy plants.

Further notes on parasitic forms include:

(1) Another host plant, the sausage tree (*Kigelia pinnata*), for the root-knot eelworm (*Heterodera radicola*).

(2) The chrysanthemum eelworm (*Aphelenchus ritzei* Schwartz) attacking chrysanthemum and *Phlox Drummondii* plants in Washington. In the former plants the eelworms were found in the leaves, whereas in the latter the majority collected in the leaf blades and stems. This species in its last larval stage was found to withstand twenty-two months' desiccation.

(3) The probable economic significance of *Dorylaimus regius* de Man., a species which is numerous in most soils. On account of the presence of an oral spine and green (chlorophyll) intestinal contents, it is thought that this eelworm may directly injure plants.

(4) *Paratylenchus nanus* Cobb, which has been taken from the exterior tissues of roots of *Zinnia elegans*, and occurred as single isolated specimens, spread through the tissues.

Numerous figures are given of *Cephalobius*, *Aphelenchus*, and *Dorylaimus*, mentioned in the text.—G. F. W.

Plant Cell Sap and Hydrogen-Ion Concentration. By W. W. Garner, C. W. Bacon, and H. A. Allard (*Jour. Agr. Res.* vol. xxvii, No. 3, Jan. 1924, pp. 119-156).—In photosynthesis, the light period determines the amount and the utilization of the carbohydrate produced. In the present paper it is shown that the light period also influences the acidity, the form of the carbohydrate, and probably the water contents of the tissues. Daily periodicity in content of free acid is noticeable in fleshy plants, but is not of such magnitude in thin-leaved plants. Growth relations and definite form of expression controlled by the length of day are regularly associated with characteristic acidity relations. In short-day plants upward elongation of the stem is associated with progressive increase in active acidity of the plant, particularly at the growing point. After flowering has been initiated, there is progressive increase in acidity in the vegetative organs. The growing seed, however, shows a progressive decline in acidity during periods of active growth. Abrupt transfer from a long day to a short day causes a sudden and sharp decline in acidity in the growing point region, and this occurs about 3 or 5 days after the transfer has been made. This drop in acidity is temporary, and is followed by a rapid rise to original level of acidity. In long-day plants exposure to a relatively short day tends to inhibit stem elongation, and this tends to keep the acidity at low level.

Among the important changes are the nature of the carbohydrates and

the amount of hydration of the tissues of the plant when exposed to daylight, and this will cause much variation according to the period of exposure.

A short bibliography is appended.—A. B.

Plants, Inhibitory Substances in. By W. L. Mallmann and C. Hemstreet (*Jour. Agr. Res.* vol. xxviii. No. 6, May 1924, pp. 599-602).—The isolation of lytic and inhibitory substances from animal sources induced the writers to a study of diseased plants, in order to determine whether such substances were found in such plants. They found that an inhibitory substance was present in a cabbage attacked by *Bacillus carotovorus*, and this was isolated. It was active against *B. carotovorus* and other soft rot-producing organisms, but this activity was lost by further transplanting. It was not destroyed at 56° C. for 20 minutes, but it was destroyed at 63° C. after 30 minutes, showing a sensitiveness to heat comparable to micro-organisms and lytic substances isolated from animal sources. The substance was present in large quantities, and it is probable that it was not a toxic product.—A. B.

Pollen Tube Growth, Preliminary Study of Rôle of Salts in. By R. A. Brink (*Bot. Gaz.*, 78 (1924), p. 361).—Using chiefly sweet-pea pollen germinating in a 15 per cent. c.p. sucrose in water the writer has shown the effects produced by the addition of various salts to the culture medium. Thus sodium chloride added to the medium in a concentration of about 11 parts per million (0.0002 M) reduces the growth of sweet-pea pollen tubes 15 per cent. A concentration of 0.01 M sodium chloride entirely prevents germination. On the other hand the presence of calcium salts in concentrations ranging from 0.02 M to 0.0002 M markedly enhances the growth of the tubes. It seems likely that the pollen tube is independent of external sources of salts as far as nutrition is concerned; but the presence of these bodies probably plays an important part in regulating the diffusion of substances through the surface layers of the protoplasm of the pollen tube. It is considered that the chief function of the salts in the style is the preservation of the semi-permeable nature of the protoplasmic membranes. The pronounced effect of calcium upon the growth of the pollen tube is related to the fact that the tubes secrete pectinase, which dissolves the middle lamella of the walls of the stylar cells. As this middle lamella consists of pectose in combination with inorganic bases, chiefly calcium, these bases are set free, and the digestion of these intercellular substances in the style is probably of great significance in the development of the male gametophyte.—W. J. D.

"Polysulphide" Sulphur in Spray Materials, The Estimation of. By W. Goodwin and H. Martin (*Jour. of Agr. Sci.*, vol. xv. Pt. 1, Jan. 1925, pp. 96-105).—The value of lime-sulphur, liver of sulphur, and ammonium polysulphide depending upon the amount of polysulphides that they contain, there is need for an exact method for the estimation of their content of polysulphide sulphur. Chapin's method has been tested under a variety of conditions and, after making slight modifications to increase rapidity and ease of manipulation, it is recommended as being sufficiently accurate for the purpose in view.—A. S.

Potato Diseases. By the Station Pathologists (*U.S. Exp. Sta. Ohio*, March 1924, *Bull.* 374, pp. 1-30, 17 figs.).—This bulletin gives a detailed account of the commoner diseases of the potato which are reported from various districts of Ohio, U.S.A. After describing the most important symptoms, it gives a detailed account of the benefits of spraying, and formulates a suitable spraying programme.—A. B.

Potato, Rhizoctonia Scab. By R. J. Noble (*Agr. Gaz. N.S.W.* vol. xxxv. pp. 631, 632; 1 fig.).—To prevent scab, the unsprouted seed potatoes are immersed for 1½ to 2 hours in a solution of mercuric chloride (1 oz. in 6¼ gallons of water).—S. E. W.

Potato Tuber Diseases, Control of. By M. Shapovalov and G. K. K. Link (*U.S. Dept. Agr., Farmer's Bull.* No. 1367, Jan. 1924, pp. 1-38; 39 figs.).—A simple non-technical account of the various diseases found in the potato tuber, and details the several methods of control. This bulletin is a revision of, and supersedes, *Bull.* 544 issued some years ago.—A. B.

Potato Tuber Respiration and Blackheart Disease. By J. P. Bennett and E. J. Bartholomew (*U.S. Agr. Exp. Sta., California Tech. Paper* No. 14, Jan. 1924, pp. 1-43; 6 tables, 3 plates).—The blackheart of the tuber of potato is ascribed to a deficiency of oxygen in injured parts of the tuber. This view is held by E. J. Bartholomew. The present paper establishes the following. A definite relationship exists between temperature, oxygen supply, and period of exposure

in the development of blackheart. Differences of different varieties at high temperatures may be due to differences in permeability of the tuber skin. In all cases oxygen is absorbed more rapidly than carbon dioxide and the respiratory ratio at the lower temperatures is less than at the higher temperatures. The rate of respiration is twice as great before the exhaustion of free oxygen as afterwards. The actual injury evidently results when anaerobic conditions are brought about in the tissues. Tubers at 20° C. and higher invariably showed only typical internal blackheart. Tubers injured at 15° C. or below usually showed both internal and external injuries. Tubers at low temperatures appear to be more easily injured by high temperatures than by non-sweet tubers.—A. B.

Primula caleiphila Hutchinson (*Bot. Mag. t. 8986*; Nov. 1923).—This plant was at first regarded (and often referred to) as the wild progenitor of *P. sinensis*, but is now regarded as distinct although closely related, and possibly also distinct from *P. rupestris*. It is a greenhouse plant from Ichang, and has been figured in a good many papers under the name *P. sinensis*.—F. J. C.

Primula obconica. By A. Petit (*Rev. Hort. 1924*, pp. 246, 265).—*Primula obconica* does not thrive in peat, but does best in a mixture of clayey loam, well-rotted manure and sand.—S. E. W.

Pseudococcus gahani Green, Notes on the Biology of. By Llewelyn Williams (*Ann. App. Biol.* vol. xi. Nos. 3 and 4, Oct. 1924, pp. 498–502).—This indigenous mealy bug occurs on *Ribes sanguineum*, *Ceanothus* species, *Laburnum*, and potato tubers.

The life-history has been worked out on potatoes vars. 'Sharpe's Express' and 'Great Scot,' details of which are given. Descriptions of the male and female bugs are included.

It was found that at a temperature of 55° F. a female took 7 to 9 days to construct an ovisac and lay her eggs. On hatching from the eggs the larvæ are very active and have a tendency to move towards the light. After 12 to 18 hours' activity they settle down on the tubers and commence to feed. The amount of "honeydew" excreted is small, even after severe infestation.

There are two broods in a year, and, as the life-cycle is an extended one, there is little danger of this species becoming a serious pest.—G. F. W.

Pyrethrum Soap. By A. Juillet (*Rev. Hort. 1924*, p. 82).—Pyrethrum soap is deadly to insects but harmless to human beings and animals. It is prepared by mixing the extract of Dalmatian Pyrethrum flowers with soap solution; 100 pounds of flower heads make 650 pounds of Pyrethrum soap, which can be diluted with ten times its volume of water. The admixture of nicotine or other poisonous matter is to be strongly deprecated.—S. E. W.

Quince, Cathay. By C. Leray (*Rev. Hort. 1924*, pp. 64–66; 1 fig.).—The wild Quince of Cathay (*Chaenomeles cathayensis*) was introduced into our gardens as an ornamental shrub, but its value as a fruit has escaped attention. This is probably due to the bitter taste of the fruit. Boiling in water before cooking removes this objectionable bitterness.—S. E. W.

Rhododendron lacteum Franch. (*Bot. Mag. t. 8988*; Nov. 1923).—A Chinese species with large trusses of sulphur-coloured flowers and elliptic oblong leaves brownish green beneath. Hardy in the south-west of England and growing in its native country to a tree about 30 feet in height.—F. J. C.

Rhododendron Thayerianum Rehder and Wilson (*Bot. Mag. t. 8983*; Nov. 1923). 12 to 15 feet high, with long narrow leaves at first covered with whitish felt, later disappearing from the upper and persistently brown on the lower surface. Flowers widely funnel-shaped, rose-red without, white within. Hardy, and said to withstand exposure to wind. Native in woods near Mupia.—F. J. C.

Root Knot in the Vineyard. By H. L. Manuel (*Agr. Gaz. N.S.W.* vol. xxxv. pp. 581–588; 2 figs.).—Eelworms (*Heterodera radicicola*) are the cause of root knot in many plants, especially in light soils; dry soils are unfavourable to their development. Phylloxera resistant vines are generally immune to root knot.

S. E. W.

Sclerotium Rolfii. By W. A. Birmingham (*Agr. Gaz. N.S.W.* vol. xxxv. pp. 441–444; 6 figs.).—Tomato, eggplant, potato, sweet potato, beet, squash, watermelon, canteloupe, rhubarb, cowpea, cauliflower, carrot, fig, cotton, violet, daphne, hydrangea, chrysanthemum, Ipomœa, tobacco, citrus fruits, seedling grape fruits and grass are attacked by *Sclerotium Rolfii*. Remove

and burn diseased plants and apply copper sulphate solution (1 pound in 7 gallons of water) to the vacant places from which the diseased plants have been removed.—S. E. W.

Seed on Plant Production, with Special Reference to Radish, Effect of Size of. By N. A. Rotunno (*Bot. Gaz.*, 78 (1924), p. 397).—As there is a considerable difference of opinion among investigators as to which size seed produces the best results, the author experimented with large numbers of seeds of *Raphanus sativus* at different seasons of the year. Some of his conclusions are as follows:—(1) The relative weights of the same sizes of seeds in different varieties differ widely, but the relative weights of the large, medium, and small seeds are approximately the same in all varieties; (2) the percentage of germination varies considerably with the large, medium and small seeds; (3) no definite statement can be made as to which size produces the heaviest roots. The medium size seeds of 'Scarlet Globe,' 'Hailstone' and 'Rapid Red' gave the best results; with the 'Crimson Giant' forcing variety the small seeds always produced the heaviest roots. When taken as a whole and averaged, the medium seeds produce the heaviest roots; (4) the results obtained with one variety are not necessarily comparable with another variety.

W. J. D.

Seeds, Revivification of. By M. Rivoire (*Rev. Hort.* 1924, pp. 92, 93).—It is a matter of common observation that in many cases seed sown as soon as it is ripe germinates freely but yields no results when it is one year old. It is a remarkable fact that if this seed is kept for three or four years it will again germinate freely. Columbine seed one year old does not germinate; when it is two years old 50 per cent. germinates. There is perfect germination with four-year-old seed, but five-year-old seed is non-fertile.

Three-year-old seed gives the best results in the case of *Centaurea candidissima*, *Eccremocarpus scaber*, *Cobaea*, *Coleus*, *Nigella*, *Gaillardia*, *Heliotrope*, *Alpine Forget-me-not*; and *Primula obconica* seed, which is non-fertile when one year old, germinates freely when two years old and perfectly when three or four years old.

Many other examples could be quoted.—S. E. W.

Sempervivella alba Stapf. (*Bot. Mag.* t. 8985; Nov. 1923).—A *Sempervivum*-like plant with fleshy rosettes an inch or more in diameter, from the which spring 6- or 8-flowered corymbs of white flowers with red tips to the buds. Native of the Himalaya up to about 10,000 feet. It has received several names, e.g. *Sempervivum sedoides*. It is apparently hardy.—F. J. C.

Soil Colloids, Binding Power of. By H. E. Middleton (*Jour. Agr. Res.* vol. xxviii. No. 6, May 1924, pp. 499-514).—The following summary is given. The method adopted was to determine the breaking strength of briquettes moulded from soils under definite conditions. The factors influencing the breaking strength were (a) the amount of moisture present, (b) the treatment of the material before moulding the briquette, (c) the pressure applied, (d) the method of drying.

The factors found to affect the binding power of soil colloids are the amount of colloidal substances present; the size and grading of the non-colloidal material; the kind of colloids, and their dispersion.

A general relation between the load per gram of the soil L and the amount of the colloids in the soil in percentage C, has been deduced and given in the formula $L = 0.42 C^{1.24}$.—A. B.

Soil Colloids, The Heat of Wetting. By M. S. Anderson (*Jour. Agr. Res.* vol. xxviii. No. 9, May 1924, pp. 927-936).—The property of liberating heat on being wetted is a characteristic of most colloidal substances and is generally thought to be a function of surface. The heats of wetting of soils and of colloidal materials isolated from the soils are given, and are found to vary widely for different soils. In some cases the amounts are comparable with the heat values for starch and synthetic inorganic gels. Practically all the heat is due to colloidal material in the wet soils. Therefore a fair approximate estimate of the colloid content may be obtained from the formula

$$\frac{\text{Heat of wetting of soil}}{\text{Heat of wetting of colloid}} \times 100.$$

This determination indicates the colloidal content of a soil as accurately as adsorption determinations.

A short bibliography is appended.—A. B.

Soil Micro-Organisms and Cyanamide. By F. E. Allison (*Jour. Agr. Res.* vol. xxviii. No. 11, June 1924, pp. 1159-1166).—This paper gives the results of laboratory tests of the effects of cyanamide and related compounds upon the number of bacteria. These were grown on Lipman's and Brown's synthetic agar, which favours particularly the ammonia-producing organisms. It was found that cyanamide produced unusually large increases of bacterial numbers in soils, the maximum usually occurring within two weeks after application. It was found that both the cyanamide and lime content were of importance. The larger the application, the larger was the stimulation within the limits of these experiments.

Urea and ammonium sulphate produced only slight effects upon bacterial numbers. The other materials used—namely, dicyanodiamide, guanyl-urea sulphate, guanidin nitrate, and biguanid nitrate—also failed to produce marked effects.—*A. B.*

Soil Moisture and Temperature and Plasmodiophora Brassicae. By J. Monteith, jun. (*Jour. Agr. Res.* vol. xxviii. No. 6, May 1924, pp. 549-562).—It has long been recognized that clubroot is influenced by various external conditions, particularly soil acidity and liming. The effects of temperature and moisture, however, have been but little studied hitherto. It was found that the worst attacks occurred at temperatures 25°C. to 30°C. The moisture-holding capacity of a soil, however, was a much more important factor. At a moisture content of 60 per cent. the disease develops rapidly, but below this, at 45 per cent. and under, the disease could not apparently be developed easily. Thus plants capable of growth in such a soil were nearly immune from the clubroot disease.

Under conditions of excessive moisture is that of secondary decay, and it is this that causes the death of the plants. It is evident that periods of low soil moisture would be helpful in checking the disease, and account for the difference in the severity of the disease in the same field in different seasons.—*A. B.*

Soy Bean, Bacterial Pustule of. By F. A. Wolf (*U.S. Jour. Agr. Res.* vol. xxix. No. 2, July 1924, pp. 57-68; 3 plates).—This disease of the soya bean is caused by a bacterium to which the name *B. phaseoli* var. *sojense* was first given by Miss Hedges. It forms yellowish colonies on nutrient agar, is flagellate, is unable to utilise any of the commoner carbohydrates save starch, and its group number is 5322-31135-1333 of American Bacteriological Chart of 1920. The parasite gains an entrance through the stomata and passes into the intercellular spaces. The pustules arise by hypertrophic changes of any of the parenchymatous tissues. They are confined to the leaves of the plant. This disease appears to be prevalent in North Carolina.—*A. B.*

Soy Bean Bacterial Pustule, a Comparison between *Bact. phaseoli* *sojense* (Hedges) with *Bact. phaseoli* (E. F. S.). By Florence Hedges (*U.S. Jour. Agr. Res.* vol. xxix. No. 5, Sept. 1924, pp. 229-252; 7 plates).—The author states that the soya bean (*Glycine hispida*) is attacked by a bacterium (*Bact. phaseoli* *sojense*, Hedges) and that reddish-brown pustules are formed upon the leaves. This bacterium is a short, 1 to 2 polar, flagellate rod, closely resembling *Bact. phaseoli* (E. F. S.) in many respects, but its colonies have characteristic markings, which are wholly absent from colonies of *Bact. phaseoli* (E. F. S.). Soya beans are not readily infected by the last organism, while *B. phaseoli* *sojense* does not attack the *Phaseolus*. Neither of the bacteria lose their virulence readily, and both may be kept alive on beet agar for over one year.—*A. B.*

Spray Gun versus Nozzle. By W. M. Walker (*Aggr. Gaz. N.S.W.* vol. xxxv. pp. 589, 590).—In dealing with American blight with a combined lead arsenate and tobacco wash, the spray gun is more effective than spraying through nozzles.
S. E. W.

Stem and Bulb Infesting Nematode, *Tylenchus dipsaci*, in the Seeds of Certain Composites, Dissemination of the. By G. H. Godfrey (*Jour. Agr. Res.* vol. xxviii. No. 5, May 3, 1924, pp. 473-478; 3 plates).—The stem eelworm has been found to be abundant on the false dandelion (*Hypochaeris radicata*) and the dandelion (*Taraxacum officinale*) in certain provinces of the United States and Canada.

Symptoms of attack comprise swollen and distorted leaves and, in addition, produce more or less distortion in the developing flower heads. In the case of the two host plants mentioned in the paper, the author has found that the eelworms penetrate into the interior of the seed, and the pest is disseminated over a large area by the agency of wind.

A list of composite hosts of various species of eelworms is included in the text.

By means of numerous photographs the symptoms of attack and the presence of eelworms in the seeds are clearly demonstrated.—G. F. W.

Stomach-poison Insecticides, Studies on Non-Arsenical. By W. Moore and F. L. Campbell (*Jour. Agr. Res.* vol. xxviii. No. 4, April 26, 1924, pp. 395-402).—This paper describes an attempt to find a satisfactory substitute for arsenical washes against the Japanese beetle, tent caterpillars (*Malacosoma americana* Fab.), Colorado beetle (*Leptinotarsa decemlineata* Say.), and the squash lady-beetle (*Epilachna borealis* Fab.). Several organic, inorganic, and insoluble aromatic compounds were tested.

Copper cyanide was the only non-arsenical tested, the toxicity of which was comparable to that of lead arsenate.

Copper thiocyanate showed high toxicity to tent caterpillars, but was non-toxic to the Japanese beetle.—G. F. W.

Strawberries, Brown Rot and other Fruit Rots of. By B. O. Dodge and N. E. Stevens (*Jour. Agr. Res.* vol. xxviii. No. 7, May 1924, pp. 643-648).—A fruit rot of strawberries found in Central Florida is caused by the mycelium of *Rhizoctonia solani* Kühn. When the berry is attacked the cells of the invaded tissues become hypertrophied. Later the cells of the decaying tissues collapse, and the mycelium becomes both inter- and intra-cellular. The "hard brown rot" caused by this *Rhizoctonia* is characterized by the fact that it begins on the lower side of the berry, advances slowly, and shows a definite line of demarcation between the sound fruit and the attacked portion. The "tan rot" caused by *Pezizella lyihri* is confined to a cone-like spot, the base of which is tan coloured, and this spot may be readily separated from the remainder of the berry.

The "leather rot" caused by a *Phytophthora* is easily distinguished by the discoloration of the vascular tissues when the fruit is cut. The berries are bitter to the taste.

Botrytis (grey mould) attacks any part of the berries and causes them to become brown.—A. B.

Strawberries, Leather Rot of. By D. H. Rose (*Jour. Agr. Res.* vol. xxviii. No. 4, April 1924, pp. 357-376; 2 plates).—A serious disease of strawberry fruits is reported, and is apparently new to America. The fungus is a *Phytophthora cactorum*, and attacks apples, pears, rhubarb, and ginseng, as well as strawberry. The name "leather rot" is suggested for it. A close relationship between leather rot and rainfall is demonstrated in the paper. Temperature is also an important factor. A short bibliography is given.—A. B.

Strawberry Leaf Scorch. By W. A. Birmingham (*Agr. Gaz. N.S.W.* vol. xxxvi. pp. 213, 214; 3 figs.).—Leaf scorch attacks the leaves and flower stalks of the strawberry. It is caused by the fungus *Mollisia Carliana*, known in the conidial stage as *Marssonina potentillae*. The remedies are to avoid blotched plants when planting out. Burn diseased plants and spray with Bordeaux mixture.—S. E. W.

Sultana Vine Pruning. By G. W. Beverley (*Agr. Gaz. N.S.W.* vol. xxxvi. pp. 135-143; 8 figs.).—The sultana bears its grapes on the second-year wood and requires a special system of pruning which leaves six rods and six spurs. The mode of pruning is clearly represented in the accompanying figures. The crop from three-year-old vines of vigorous growth is increased by cincturing, but only a narrow strip of bark is removed. In autumn apply 1 cwt. potassium sulphate, 1 cwt. superphosphate, and $\frac{1}{2}$ cwt. of bone dust to the acre. When the new growth is well out, apply 1 cwt. superphosphate and 5 lb. of bone dust. If the growth of wood is poor, add 1 cwt. of ammonium sulphate in spring.—S. E. W.

Tecophilaea cyanocrocus Leyb. (*Bot. Mag.* t. 8987; Nov. 1923).—This beautiful blue-flowered Amaryllid is well known to plant lovers, although difficult to grow. It grows at an altitude of about 10,000 feet in Chile, where it flowers in October and November. It ought to be hardy, but succeeds best under glass, although it is by no means easy to grow there.—F. J. C.

Tobacco Diseases and their Control. By James Johnson (*U.S. Dept. Agr. and Exp. Sta., Wisconsin, Bull.* No. 1256, Oct. 1924, pp. 1-56; 17 plates).—The diseases of the tobacco may be classified into three classes: Stem Diseases, Leaf Diseases, and Root Diseases.

The first series include damping off (*Pythium* and *Rhizoctonia solani*); stem rots (*Sclerotium Rolfsii*, *Phytophthora nicotianae*); Hollow stem (*Bacillus carotovorus* and *Bact. solanacearum*); Fusarium wilt (*F. oxysporum* var. *nicotianae*).

The second series attacking the roots include the black rot (*Thielavia basicola*); the brown rot (*Thielavia* sp.). The root knot Nematode (*Heterodera radiculicola*) and the broomrape (*Orobancha ramosa*) may also be mentioned.

The third series attacking the leaves include the Wildfire disease (*Bact. tabacum*); Black fire leaf-spot disease (*Bact. angulatum*); the Wisconsin leaf spot (*Bact. melleum*); the "frog-eye" disease (*Cercospora nicotianae*); the blue mildew (*Peronospora hyoscyami*); and brown rusts (*Macrosporium longipes* n. sp. and *M. tabacinum* n. sp.), may be mentioned.

Of the non-parasitic leaf spots, the more important include the mosaic disease and chlorosis due to physiological disturbances of the plant organism.

Various diseases of curing tobacco are known, and these include shed-burn, wet butts, white veins, must, and moulds, and these often cause much loss in curing factories.

A bibliography is appended.—A. B.

Tomato Fusarium Wilt and its Control. By J. W. Lesley (*U.S. Agr. Exp. Sta., California, Cir. No. 274*, Jan. 1924, pp. 1-6; 2 figs.).—Fusarium wilt of the tomato is caused by *F. lycopersici* (Sacc.) and this disease inflicts serious losses on tomato fields in California. The soil should be free from the fungus and wilt-resistant varieties should be used. The varieties 'Norton' and 'Globe' are recommended as they are resistant to this disease, and are very useful as commercial varieties, the 'Globe' being an early variety and useful for storage and transport.—A. B.

Tomato Leaf-Spot, The Control of. By Fred. J. Pritchard and W. S. Porte (*U.S. Dept. Agr. Bull. No. 1288*, Dec. 1924, pp. 1-20; 9 figs.).—Tomato leaf-spot or blight (*Septoria lycopersici* Speg.) is widely distributed in the United States and causes much damage to the annual yield. It lives over the winter on dead tomato leaves and stems and produces numerous pycnidia and conidia during spring and summer. It also attacks many weeds and grasses, including old corn stalks. The destruction of these weeds is therefore an important measure of control. Careful cultivation and sound, healthy seedlings are also recommended.—A. B.

Tortrix pronubana Hb., The Life-history of; with Special Reference to the Larval and Pupal Stages. By R. C. Fisher (*Ann. App. Biol.* vol. xi. Nos. 3 and 4, Oct. 1924, pp. 395-447; 16 figs., 1 plate).—A detailed and exhaustive account of the life-history of a serious pest of plants, particularly carnations, grown under glass. The egg, larval, pupal and adult stages are minutely described.

The economic aspect is fully dealt with, and a list of eighty host plants, both under glass and in the open, is included.

The symptoms of attack are:—(1) spinning together of the small leaves; (2) devouring of foliage and flowers; and (3) small holes, from which larvæ can be extracted (especially in the case of carnations and Pimeleas).

Dispersal of the pest takes place particularly in the first larval stage, when the young larvæ are very active and quickly move from plant to plant. Other methods of dispersal include (1) through the characteristic habit of the young larvæ hanging in festoons from the leaf tips, they are blown by means of the slightest draught on to neighbouring plants; (2) the adult moths are active fliers and will lay their eggs on practically any plants, and even on the sides and roofs of glasshouses; and (3) the introduction of infested plants into houses formerly free.

Remedial measures include the systematic handpicking of egg-masses, larvæ and pupæ; the application of nicotine or lead arsenate washes immediately after the eggs hatch; and the screening of doors and ventilators with gauze or muslin to prevent the moths entering from badly infested houses.

This species of *Tortrix* is not indigenous to Britain, and in consequence is singularly free from the attacks of parasites.—G. F. W.

Turraea floribunda Hochst. (*Bot. Mag.* t. 8924; Nov. 1923).—Deciduous shrub or small tree with downy shoots, lanceolate leaves about 2 inches long, and clusters of spidery greenish-white flowers. Very sweetly scented. Native of S. Africa near Durban.—F. J. C.

Viburnum Davidii Franch. (*Bot. Mag.* t. 8980; Nov. 1923).—A dwarf shrub with opposite dark and shining green leaves about 4 inches in length, distinctly 3-veined. Flowers in corymbs, white; fruits blue. Native of W. China. Hardy at least in Southern England.—F. J. C.

Weeds of New South Wales. By W. F. Blakely (*Agr. Gaz. N.S.W.* vol. xxxv. pp. 419-421 and 786, 787; 2 plates).—Russian knapweed (*Centaurea picris*) is very hardy and abounds in lucerne fields. Field bindweed (*Convolvulus arvensis*) is very difficult to eradicate. In moist ground it may be smothered out with a crop of Sorghum. The seeds are injurious to stock.—S. E. W.

Weevil, Brown Vegetable. By T. McCarthy (*Agr. Gaz. N.S.W.* vol. xxxv. pp. 573-580; 7 figs.).—The Brown Vegetable Weevil (*Listroderes nociva*) formerly known as the Buff-coloured Tomato Weevil (*Desiantha nociva*) was described by Froggatt in the *Agr. Gaz. N.S.W.* vol. xxvi. p. 1065. The adult weevil and the larvæ feed at night, attacking by preference potato or tomato plants. It also infests the wild Cape weed (*Cryptostemma calendulaceum*). To destroy the pest spray or dust with calcium arsenate and in the evenings place the tops of potato plants or Cape weed dipped in an arsenical solution between the potato or tomato rows.—*S. E. W.*

Wood, Decay in. By E. E. Hubert (*U.S. Jour. Agr. Res.* vol. xxix. No. 11, Dec. 1924, pp. 523-568; 11 plates).—The author gives methods for complete diagnosis of wood decays with details of representative wood-destroying fungi of economic importance. The various decays of timber are classified under two heads, white rots and brown rots.

A comparison of the incipient discolorations and zone lines of various wood rots indicates the value of these gross characters in diagnostic tests. Studies of methods of cell-wall penetration, size and shape of bore holes, hyphal characteristics and general pathological effect upon cell structures have furnished evidence of value of these microscopical studies.

A method of checking the association of the wood-destroying fungi with the particular forms of decay is described.

It is thought that the use of diagnostic methods will give data of scientific value in the solution of numerous problems relating to staining and rotting of wood and wood products.

A full bibliography is appended.—*A. B.*

NOTES.

Our Fellow, Mr. Jas. W. Chant, of The Chestnuts, Rayleigh, Essex, has during the last few years collected a considerable number of species of Cactaceae, and has now decided to devote his attention to Phyllocactus alone. He would be glad to correspond with any other Fellow who would exchange cuttings or plants of Phyllocactus for other Cacti and hothouse plants.

Mr. E. F. Brady, of 43 Viewway, Nedlands Park, Western Australia, would like to exchange seeds of Australian plants for those of rare plants of other countries.

EXTRACTS FROM THE PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

JANUARY 15, 1924.

C. T. MUSGRAVE, Esq., in the Chair.

Two hundred and seventeen Fellows and one Associate were elected, and six Societies affiliated.

A lecture was given by Mrs. Henshaw on "The Alpine Flowers of Western Canada."

GENERAL MEETING.

JANUARY 29, 1924.

Sir WILLIAM LAWRENCE, Bt., in the Chair.

One hundred and twenty-six Fellows and four Associates were elected, and six Societies affiliated.

A lecture was given by Captain F. Kingdon Ward on "New Plants from the Tibetan frontiers."

ANNUAL GENERAL MEETING.

FEBRUARY 12, 1924.

The Rt. Hon. Lord LAMBOURNE, P.C., V.M.H., in the Chair.

The Minutes of the last Annual General Meeting were read and signed. One hundred and fifty-seven Fellows and four Associates were elected, and five Societies affiliated.

Lord Lambourne then moved the adoption of the Council's report for 1923 and dwelt on the most important features of the year's work. The motion was seconded by the Treasurer, Mr. Musgrave, who explained the financial position and the annual balance-sheet.

The Chairman then drew attention to the Society's need for further accommodation, both for its Shows and for its offices, library and lecture room. He moved the following resolution, which was seconded by the Treasurer and supported by various Fellows present and carried *nem. con.* :—

"That this General Meeting of the Fellows of the Royal Horticultural Society approves of the policy of the Council with regard to the site for a new Hall and authorizes it to proceed with the scheme."

The following, having been duly proposed and seconded as President, Treasurer, Secretary, Members of the Council, Vice-Presidents and Auditor, were declared elected by the Chairman under By-law 74, as no other names had been proposed.

<i>As President.</i>	<i>Proposed by</i>	<i>Seconded by</i>
The Rt. Hon. The Lord Lambourne, P.C., C.V.O., V.M.H.	Mr. C. T. Musgrave.	Mr. W. A. Bilney.

<i>As Treasurer.</i>		
Sir William Lawrence, Bt.	Mr. H. B. May.	Mr. E. A. Bunyard.

<i>As Secretary.</i>		
Mr. W. R. Dykes, M.A., L.-és-L.	Mr. E. A. Bowles.	Mr. J. Hudson.

<i>As Members of Council.</i>		
The Right Hon. The Lord Lambourne.	Sir William Lawrence, Bt., and Mr. W. R. Oldham.	Mr. W. Cuthbertson and Mr. R. W. Wallace.
Mr. G. Monro.	The Rt. Hon. The Lord Lambourne and Mr. W. R. Oldham.	Mr. W. A. Bilney and Mr. R. W. Wallace.
Mr. C. G. A. Nix.	Mr. G. W. E. Loder.	Dr. A. W. Hill.

<i>As Vice-Presidents.</i>		
The Duke of Bedford, K.G., F.R.S.	}	The Rt. Hon. The Lord Lambourne.
The Duke of Portland, K.G., P.C., G.C.V.O.		
The Hon. Vicary Gibbs, V.M.H.		
Field-Marshal Lord Gren- fell of Kilvey, G.C.B., G.C.M.G.		
Sir George Holford, K.C.V.O., C.I.E.		
Sir James Knott, Bt.		
Sir John T. D. Llewelyn, Bt., D.P., J.P., F.L.S., V.M.H.		
Sir Daniel Morris, K.C.M.G., J.P., D.Sc., D.C.L., F.L.S., V.M.H.		
Sir David Prain, C.M.G., F.R.S., V.M.H.		
Viscount Ullswater, P.C.		
Sir Harry J. Veitch, V.M.H.		
Mr. J. C. Williams.		

<i>As Auditor.</i>		
Mr. Alfred C. Harper.	Mr. C. T. Musgrave.	Mr. W. Cuthbertson.

The Victoria Medals of Honour, the Lawrence Medal and the Veitch Memorial Medals were handed to the recipients by Lord Lambourne.

The Meeting closed with a vote of thanks to the President, proposed by Mr. R. C. Notcutt.

REPORT OF THE COUNCIL FOR THE YEAR 1923.

1. **The Year 1923.**—During the past year the Society has steadily grown and prospered, but there are no sensational developments to be recorded.

2. **Shows in 1923.**—The level of excellence among the exhibits in the Hall which was noticed in 1922 has been well maintained during 1923. At times the number of visitors has been so great that the Council realizes that the greatest problem with which it is faced is to provide adequate accommodation for the groups staged by exhibitors and for their inspection by the Fellows of the Society. The problem is undoubtedly difficult, but it has been and is receiving very serious attention, and it is hoped that it will be solved before long.

3. **The Chelsea Show.**—The Chelsea Show was a success in spite of the weather, which, on the opening day at any rate, could hardly have been worse. Fellows and visitors came in vast numbers, determined to see the flowers in spite of everything.

It was disappointing to find that the arrangements which had been made to provide seating accommodation for visitors all down the central avenue and on a piece of ground near the rock gardens were rendered practically useless by the cold, wet weather.

The catering arrangements made by Messrs. Lyons & Co. were most successful, and it was unfortunate that the weather robbed the firm of the reward of its enterprise.

4. **Holland Park Rink.**—The Autumn Show produced a fine display of flowers at Holland Park Rink, but the fruit was hardly up to the average, which was only to be expected in such a bad fruit year. The difficulty of combining the arrangement of the floral groups, which must be settled some weeks in advance, with the competitive classes, for which entries should be accepted to within a short time of the Show, led the Council to decide, on the experience of two years, that in 1924 an Autumn Show, consisting chiefly of flowers, should be held at Holland Park Rink on September 23, 24, and 25, and a Show of competitive classes for fruit and vegetables in the Hall at Vincent Square on October 7 and 8.

5. **Lindley Library.**—During the course of the year several important additions have been made to this Library, for it is the policy of the Council to add to it copies of rare books on horticultural matters which come into the market, in order to make the Library as complete as possible. Among recent acquisitions are: *Jacquin's* "Icones plantarum rariorum Vindobonæ"; "Hortus botanicus vindobonensis"; "Fragmenta botanica" and "Oxalis"; *Ruis et Pavon's* "Flora peruviana et chilensis," a copy with coloured plates; *Bonpland's* "Description des plantes rares cultivées à Malmaison et à Navarre"; and *Venteuil's* "Jardin de la Malmaison."

With a view to making the Library more accessible to Fellows, it is now the rule that it remains open until the time of the closing of the Shows, instead of closing at 5 P.M. throughout the year.

6. **Committees.**—The Council has decided to limit the various committees to a fixed number, and it has therefore been obliged to reduce the number of invitations to serve on the various committees for 1924. The Council takes this opportunity of recording the thanks of the Society to those who have discharged the duties of the committees during the year.

7. **Division of the Floral Committee.**—Owing to the ever-increasing interest in shrubs and ornamental trees and, consequently, in the numbers of these that are shown at the Meetings of the Society, the Council has decided to divide the Floral Committee into two sub-committees, one of which, under the Chairmanship of Mr. H. B. May, will deal with florists' flowers, and the other, under the Chairmanship of Mr. G. W. E. Loder, will deal with trees, shrubs, and botanical species. It is hoped that this arrangement will both expedite the judging of novelties and also increase the value of the awards made to them.

8. **The Treasurer's Retirement.**—The Council regrets to have to announce that Mr. C. T. Musgrave has asked to be relieved of the duties of Treasurer. He finds that the work of the Society has increased to such an extent, and he is necessarily a member of so many committees, that they demand more of his time than he is able to give. No one could have been more zealous in carrying out the duties of his office or have done more to help the Council of the Society in every possible way. Even though he ceases to be Treasurer, he will remain a Member of the Council and of the various committees, where his help and advice will still be available.

9. **Obituary.**—It is with deep regret that the Council records the death on March 2, 1923, of the Rev. W. Wilks, who was Secretary of the Society from 1888 to 1920, and a Member of the Council from 1920 to 1923. An appreciation of Mr. Wilks, and of the work he did for the Society, was published in the September number of the JOURNAL. We must all be glad that one who did so much for horticulture was able, down to the very day before he died, to enjoy his garden and the flowers he loved so well.

The Council also records with regret the death of Mr. Owen Thomas, a former Member of the Council, and at one time head gardener at Chatsworth and finally at Windsor Castle; of Mr. Thomas Challis, who for many years was a valued member of the Fruit Committee and a trusted judge at the Society's Shows; of the Rev. C. T. Digby, a well-known grower of Daffodils, who was for many years a member of the Narcissus Committee; and of Mr. Herbert Jones, of Bath, a talented designer of formal gardens and a well-known figure for several years at the Chelsea Show. The Society is also the poorer by the death of the Rev. Canon Fowler, for many years a member of the Scientific and Narcissus Committees.

10. **Pritzel's *Iconum Botanicarum* Index.**—The work on Pritzel has progressed steadily and the number of references which have been typed out amounts to nearly 250,000. Between a quarter and a third of these still remain to be checked, and there are still a number of botanical works to be examined and entries made from them, with the result that, in the end, there will probably not be far short of 300,000 entries. It is hoped that the card index on which these are being arranged will be complete by the end of 1925 or shortly afterwards, and the work will then be ready for the printer. An index will thus be available of all botanical illustrations from 1753 down to the end of 1920, and it is hoped that the completeness of the work will justify the time that has been expended in its compilation. In the meanwhile, anyone who wants to know what illustrations exist of any given plant is able to refer to the card index, which is at present housed in the Herbarium at the Royal Botanic Gardens, Kew.

11. **Lectures for Circulation among Affiliated Societies.**—A revision is now taking place of the list of lectures available for the use of Affiliated Societies. Several new lectures are being added to the list, which it is hoped will be ready by the early summer, in order that local societies may avail themselves of the lectures when making up their programme for next autumn. In most cases the lectures will be illustrated, and the list will be circulated to all Affiliated Societies as soon as it is ready.

12. **The Proposed Conifer Conference.**—It has unfortunately been found impossible to hold a Conifer Conference in 1924, largely because several of those who would have taken an important part in such a Conference will be absent in the autumn at the Meeting of the British Association in Canada. It is hoped, however, to arrange the Conference for the autumn of 1925.

13. **The Veitch Memorial Trust.**—Veitch Memorial Medals, which are given to those who have helped the advancement and improvement of the science and practice of horticulture, have been awarded in gold to Mr. E. A. Bowles, the well-known amateur and authority on Crocuses, Colchicums, and many other garden plants; to Mr. R. Irwin Lynch, the late Curator of the Cambridge Botanic Garden; and to Mr. John Heal, who was for many years foreman to Messrs. James Veitch and Sons, and to whose skill we owe the development from wild species of many of the good garden plants introduced by the firm. The Medal in silver has been awarded to Mr. J. O'Brien, for thirty-four years Secretary of the Orchid Committee; to Mr. Sydney Morris, for his work on the development of garden varieties of Montbretia; and to Mr. T. G. Hodgson, the Chairman of the Council of the York Gala, to whose enterprise the success and reputation of that

Exhibition have been largely due. The Medal in silver and a prize of £25 have also been awarded both to Mr. W. Dallimore and to Mr. A. Bruce Jackson for their work on the *Coniferae* which has recently been published in the form of a valuable handbook.

14. **Sutton Cups for Vegetables.**—The Council has gratefully accepted a suggestion from Messrs. Sutton & Sons of Reading that they should withdraw the Sutton Challenge Cup for Vegetables and give in its place two Silver Cups to be won outright, the one by the amateur who makes the best exhibit of vegetables at Chelsea and the other by the winner in Class 1, for twelve distinct kinds of vegetables at the Fruit and Vegetable Show on October 7 and 8.

15. **Cory Cup and Sander Medal.**—The Council has accepted the suggestion from Mr. Reginald Cory that, in future, the Cory Cup should be awarded for the best hardy plant of garden origin which appears at the Society's Shows in the course of the year. For this year the Cup has been awarded to Mr. P. D. Williams of Lanarth, St. Keverne, for raising *Cytisus* 'Cornish Cream,' which obtained an Award of Merit on May 8, 1923.

The well-known firm of Messrs. Sander & Sons has presented to the Society, for award in 1924 and succeeding years, the Sander Medal in memory of the good work that was done for horticulture by H. F. C. Sander, the founder of the firm. This Medal will be awarded annually for the best greenhouse novelty of the year.

16. **Victoria Medal of Honour.**—Vacancies among the sixty-three holders of the V.M.H., caused by the deaths of Sir Isaac Bayley Balfour, Mr. Thomas Challis, Mr. J. W. McHattie, Mr. John Seden, Mr. Owen Thomas, and the Rev. W. Wilks, have been filled by the election of Mr. N. F. Barnes, Mr. A. Grove, Mr. F. J. Hanbury, Mr. T. Hay, Mr. S. Morris, and Mr. Charles E. Pearson.

17. **Lawrence Medal.**—The Lawrence Medal has been awarded to Messrs. Charlesworth & Co. for their exhibit of Orchids at the Chelsea Show.

18. **Increase in Membership.**—The following table shows the increase in the number of Fellows of the Society during 1923 :

LOSS BY DEATH IN 1923.					FELLOWS ELECTED IN 1923.				
Life Fellows	..	..	..	6	Life Fellows	..	..	..	30
4 Guineas	..	..	..	4	4 Guineas	..	..	..	15
2 "	..	..	..	132	2 "	..	..	..	1,447
1 "	..	..	..	112	1 "	..	..	..	1,086
Associates	..	..	..	2	Associates	..	..	..	68
				256	Affiliated Societies	..	..	..	79
LOSS BY RESIGNATION, &C.									2,725
4 Guineas	..	..	..	5	Deaths and Resignations	..	..	..	1,680
2 "	..	..	..	471					
1 "	..	..	..	784					
Associates	..	..	..	58	NUMERICAL INCREASE	..	..	..	1,045
Affiliated Societies	..	..	..	106					
				1,424					
TOTAL LOSS	..	..	..	1,680	Total on November 15, 1922	..	..	..	18,142
					Total on November 15, 1923	..	..	..	19,187

The continued increase in the numbers of the Society entails increased work on the staff in the Society's offices, and the Council wishes to place on record its appreciation of the way in which this increasingly onerous work has been carried through by all concerned.

19. **Committees, etc.**—Finally, the Council wishes to express its gratitude to those Fellows of the Society who have served on one or other of its Committees and without whose help the work could not be carried on. The Council also owes its thanks to the Press for the way in which it has supported the work of the Society and kept it before the public.

WISLEY REPORT.

The year at Wisley has been climatically a very trying one, but most of the work planned has been carried through, and the number of visitors again shows an increase over any previous year. The increased facilities for reaching Wisley by omnibus from Kingston and Guildford are becoming better known, and greater numbers of visitors come in consequence, nor has there been any falling off in the number of parties of gardeners visiting the Garden.

20. Rose-trial Garden.—The tests of roses for value in the garden announced in the last Report have made a satisfactory start, a large number of the newest roses having been planted along with well-known ones for comparison. The request issued to raisers for their new varieties has been met with a gratifying response, and the new ground will be open for inspection by Fellows, and judging will commence during the coming summer. The opportunity has been taken in forming backgrounds to the rose-beds to use a number of different plants as hedges in order to enable visitors to judge their comparative merits. The Rose-trial Garden is about half-a-mile from the old entrance to the Garden and towards Byfleet.

21. Fruit-testing Ground.—Good progress has also been made with the Fruit tests which are being carried out in conjunction with and aided by a grant from the Ministry of Agriculture. These are near the Rose-trial Garden and the Fruit Experiment Ground and will be open for inspection during the coming season. In connexion with them and for the information of Fellows a large number of varieties of all kinds of hardy fruit will be grown, in addition to or in substitution for the old fruit collections.

22. The Garden.—In addition to the reconstruction of the stone bank near the greenhouses, and paving in connexion therewith, further planting has been carried out in "Seven Acres," where the shrubs collected by Farrer and Forrest are making good growth, a large heath garden is in process of construction there, a path is being arranged along the River Wey to the new Rose-trial Garden, much replanting following the removal of several trees and large shrubs from the Rock Garden has been done, the nursery ground available for the Rock Garden is being extended, as well as the Iris Garden which is being made to join up with the top of the Rock Garden. Adequate treatment of the road near the Laboratory front and of the entrance to the Garden is now under consideration.

23. School of Horticulture.—The full complement of thirty students is in attendance at the School, but this branch of the work is still handicapped by the need for a Hostel, for suitable lodgings near the Garden are increasingly difficult to obtain. Twelve students have completed their course during the year. The question of the recognition of the Wisley School of Horticulture as a School of the London University is again under the consideration of the Council.

24. Chelsea Show.—An exhibit was again arranged at the Chelsea Show to bring before visitors some of the experimental work undertaken at Wisley. The attention the exhibit attracted and the number of questions asked showed the greatly increased interest in horticultural experiments.

25. Experimental Work.—During the year the results obtained in Dr. Darbishire's green manuring experiments have been tested with different crops and upon a larger scale; Mr. Rawes has been able to test the validity of the conclusions arrived at on the relation between season and growth after summer pruning, and to continue and extend in detail the pollination experiments upon which we have been engaged for some years. Mr. Buxton has made some further investigations upon the development of buds in currants. Mr. Dowson has reports on a new mildew of sweet peas and on rose die-back in preparation, and is investigating a flower-spike disease of antirrhinums, wet stem in tulips, and stem rot in carnations. Mr. Wilson is investigating the eelworm disease of phlox, soil aphides and their treatment, and other pests. Mr. Simmonds is making a comparison of air temperatures at different levels.

26. Gifts.—In addition to gifts of large numbers of plants and seeds to the Garden, we have also to acknowledge gifts of money and books for the Library at Wisley, and of a portrait of the late Mr. Wright for the Hall. For all these the Council tenders the donors its grateful thanks.

27. **Acknowledgments.**—The Council has again to thank the Horticultural Press for the wide publicity it has given to the work at Wisley; the members of the Judging Committees, and of the Garden Committee, who have devoted much time and attention to the work carried out there; and the members of the staff for their efforts in carrying out the work entrusted to them.

28. **Conclusion.**—The Wisley Committee has spent much time on the consideration of the relative importance of the Trials, the Rock Garden, and the remainder of the Garden, and the Council is awaiting a final Report from the Wisley Committee on the subject. Three eminent men of science have been asked to advise regarding Research Work. The question of experimental and research work is always one of finance. A means of helping in this direction would be the establishment of research scholarships of either a temporary or permanent character. Every great undertaking is faced with the problem of research work, of its necessary cost and of the advantages which it expects to derive from it.

Signed on behalf of the Council,
LAMBOURNE,
President.

11th December, 1923.

ANNUAL REVENUE & EXPENDITURE ACCOUNT

	£	s.	d.	£	s.	d.
TO ESTABLISHMENT CHARGES—						
Ground Rent	690	0	0			
Rates and Taxes	1,155	10	8			
Water Rate	88	17	0			
Electric Light	329	2	0			
Gas	138	8	3			
				2,401	17	11
Salaries and Wages	4,696	10	3			
Annuities	224	11	2			
Printing and Stationery	930	3	5			
Publications	437	17	10			
Botanical Magazine, Vols. 1922-23	355	10	2			
Postages	588	1	9			
Fuel	82	3	0			
Professional Fees	210	16	10			
Gratuities	156	18	10			
Repairs and Renewals	345	2	0			
Miscellaneous Expenses	188	9	3			
				8,216	4	6
„ INSURANCES				111	13	8
„ JOURNAL, PRINTING AND POSTAGE				1,554	18	0
„ STAFF PENSION	282	6	0			
Less contributed by the Staff, as per scheme	142	3	4			
				140	2	8
„ MEETINGS—						
Spring Meeting	3,629	19	11			
Autumn Meeting	1,496	3	2			
Labour, Floral Meetings and Conferences	119	7	0			
Expenses, do. do.	177	15	5			
Council, Committee and Deputation Expenses	603	2	0			
Painting Certificates	95	1	6			
				6,121	9	0
„ INSPECTION OF GARDENS				313	14	6
„ PRIZES AND MEDALS—						
Awarded at Society's Meetings				459	1	9
„ CONTRIBUTION TO LINDLEY LIBRARY—						
Purchase of Books	788	15	9			
Expenses	201	10	6			
				990	6	3
„ SPECIAL EXPENDITURE—						
Pritzel Revision	638	15	8			
Donation to Mrs. Wright's Annuity Fund	117	13	6			
				756	9	2
„ DEPRECIATION—						
Hall Glass Roof, Furniture, and Appliances for Meetings, &c.				403	15	2
„ EXAMINATIONS IN HORTICULTURE—						
Expenses	252	6	5			
Less Fees	210	13	6			
				41	12	11
„ BALANCE carried forward				22,823	14	0
				£44,334	19	6
TO WISLEY—						
Capital Expenditure	72	8	2			
Excess of Expenditure over Revenue	7,780	19	3			
„ GENERAL RESERVE FUND	15,000	0	0			
„ WEATHER INSURANCE FUND FOR CHELSEA AND OTHER MEETINGS	500	0	0			
				23,353	7	5
„ BALANCE, AS PER BALANCE SHEET				1,220	6	7
				£24,573	14	0

FOR YEAR ENDED 31st DECEMBER, 1923.

Cr.

	£	s	d.	£	s	d.
By ANNUAL SUBSCRIPTIONS				28,751	12	0
„ ENTRANCE FEES				575	8	0
„ LEGACY				100	0	0
„ DIVIDENDS AND INTEREST	3,628	4	11			
„ do. do. DAVIS TRUST	53	7	9			
				3,681	12	8
„ MEETINGS—						
Spring Meeting	4,596	6	5			
Autumn Meeting	653	16	6			
Takings at Hall Meetings	444	6	11			
				5,694	9	10
„ HALL LETTINGS	4,271	19	11			
Less Labour Expenses	595	11	1			
				3,676	8	10
„ JOURNALS AND OTHER PUBLICATIONS—						
Advertisements	472	11	9			
Sale of Publications	519	2	4			
				991	14	1
„ PRIZES AND MEDALS				238	5	2
„ LIFE COMPOSITIONS—						
Being amount paid by Fellows now deceased.				68	5	0
„ RENT OF FREEHOLD PROPERTY				247	3	0
„ INSPECTION OF GARDENS				310	0	11

£44,334 19 6

By Balance brought forward	22,823	14	0
„ General Revenue Account	1,750	0	0

£24,573 14 0

VINCENT SQUARE—BALANCE

LIABILITIES.

	£	s.	d.	£	s.	d.
To CAPITAL FUNDS ACCOUNT—	48,871	16	2			
Less Fees paid by Fellows now deceased .	68	5	0			
				48,803	11	2
„ LIFE COMPOSITIONS, 1923				669	18	0
„ SUNDRY CREDITORS				1,597	9	1
„ SUBSCRIPTIONS, &c., paid in advance				876	15	0
„ GENERAL RESERVE FUND				30,000	0	0
„ DEPRECIATION AND RENEWALS FUND—						
Balance 31st December, 1922	6,106	1	1			
Added 1923	403	15	2			
				6,509	16	3
„ WEATHER INSURANCE FUND for Chelsea and other Meetings—						
Balance at 31st December, 1922	942	4	9			
Added 1923	500	0	0			
				1,442	4	9
„ LABORATORY PRIZE FUND—						
Balance 31st December, 1922	8	11	1			
Dividends (Nicholson Memorial Fund)	1	18	1			
				10	9	2
„ WILLIAMS MEMORIAL FUND	77	16	11			
„ MASTERS MEMORIAL FUND	147	19	5			
„ SCHRÖDER PENSION	6	6	8			
„ LINDLEY LIBRARY TRUST	10	0	0			
„ SIR JAMES KNOTT TRUST	60	0	0			
„ MRS. EDWARD HARDING CUP FUND	63	3	3			
„ VEITCH MEMORIAL FUND	275	2	2			
				640	8	5
„ GENERAL REVENUE ACCOUNT	55,293	5	9			
„ REVENUE FOR THE YEAR 1923, as per annexed Account	1,220	6	7			
				56,513	12	4
Less Release of Mortgage on Freehold	£1,000	0	0			
Revenue and Expenditure Account	1,750	0	0			
				2,750	0	0
				53,763	12	4
				£144,314	4	2

ASSETS.									
By CAPITAL EXPENDITURE—	£	s.	d.	£	s.	d.	£	s.	d.
„ NEW HALL AND OFFICES—									
As at 31st December, 1922.				41,277	13	4			
„ FURNISHING HALL AND OFFICES—									
As at 31st December, 1922.	2,646	8	2						
Add Purchases, 1923.	78	15	5						
				2,725	3	7			
„ FREEHOLD PROPERTY, WISLEY				8,268	16	6			
							52,271	13	5
„ APPLIANCES FOR MEETINGS							366	14	3
„ SUNDRY DEBTORS AND PAYMENTS MADE IN ADVANCE							2,622	18	3
„ WOKING WATER CO.—									
Deposit in respect of laying water-mains from Ripley to Wisley Gardens							1,260	0	0
„ EDUCATION CHARTS, Johnson, Riddle & Co.							242	15	0
„ BOTANICAL MAGAZINE—									
As at 31st December, 1922				702	7	6			
Add Expenses, 1923.				523	5	10			
							1,225	13	4
Less Sales, 1923							853	14	9
									371 18 7
„ INVESTMENT OF DEPRECIATION AND RENEWALS FUND—									
5 % War Loan 1929-47, £4,173 15s. 7d. cost	3,898	4	11						
3½ % War Loan 1925-28, £305 5s. 1d.	266	16	6						
3½ % Conversion Loan, 1961, £527 12s. 6d.	399	16	6						
5 % London County Stock, 1940-60, £610 14s. 0d.	514	12	10						
2½ % Metropolitan Consolidated Stock, 1919-49, £1,000 2s. 0d.	515	5	2						
2¼ % Plymouth Corporation Redeemable Stock, 1918-58, £225 9s. 4d.	111	6	5						
6 % Plymouth Corporation Redeemable Stock, 1940-50, £123 15s. 6d.	117	5	3						
2½ % Bristol Corporation Debenture Redeemable Stock, 1957, £607 12s. 0d.	282	13	6						
	6,106	1	1						
Cash for Investment	403	15	2				6,509	16	3
„ INSURANCE FUND INVESTMENT ACCOUNT—									
5 % War Loan, 1929-47, £1,486 17s. 11d.							1,442	4	9
„ INVESTMENTS, as per Schedule							44,642	0	0
„ GENERAL RESERVE FUND—INVESTMENTS							30,000	0	0
„ CASH AT BANK							5,117	19	10
Less cash awaiting Investment—									
Wisley Depreciation Fund	£130	1	0						
Vincent Square Fund	403	15	2						
							533	16	2
									4,584 3 8
									£144,314 4 2

I have audited the books from which the foregoing Accounts are compiled, and certify that they exhibit a true and correct statement of the position of the Society on 31st December, 1923. In the above total of Assets £144,314 4s. 2d. are included investments and cash amounting to a total sum of £6,509 16s. 3d., representing depreciation reserves on account of such matters as roof renewal, hall painting, &c., and these funds are not available for the General Purposes of the Society.

ALFRED C. HARPER, F.C.A., Auditor

(HARPER BROS. & FEATHER, Chartered Accountants),

35 GREAT TOWER STREET, LONDON, E.C. 3.

22nd January, 1924.

Dr. WISLEY GARDENS—ANNUAL REVENUE & EXPENDITURE

	£	s.	d.	£	s.	d.
To SALARIES—						
Wisley Gardens and Research Station				3,645	10	6
„ RATES AND TAXES	122	5	7			
„ WATER RATE	67	8	7			
„ INSURANCES	125	5	11			
„ LABOUR	3,511	7	5			
„ GARDEN IMPLEMENTS	130	13	11			
„ LOAM AND MANURE	38	14	6			
„ REPAIRS	400	2	8			
„ FUEL	688	12	8			
„ PROFESSIONAL FEES	62	10	0			
				5,147	1	3
„ MISCELLANEOUS EXPENSES—						
Garden	867	11	1			
Laboratory	76	0	5			
Trees and Shrubs	57	14	3			
				1,001	5	9
„ STAFF PENSION	171	1	1			
Less contributed by Staff, as per scheme	91	10	0			
				79	11	1
„ DEPRECIATION—						
Glass Houses, Plant and Materials	378	19	0			
Motors	299	0	0			
				677	19	0
„ SPECIAL EXPENDITURE—						
Replacement of Boilers				533	14	9
				£11,085	2	4

ACCOUNT FOR YEAR ENDED 31st DECEMBER, 1923.

Cr.

	£	s.	d.
By DIVIDENDS AND INTEREST	1,411	11	8
„ PRODUCE SOLD	952	8	11
„ ANALYSIS FEES	29	17	6
„ STUDENTS' FEES	110	5	0
„ CONTRIBUTION BY MINISTRY OF AGRICULTURE—			
On account of Green Manuring	200	0	0
On account of Fruit Testing Station	600	0	0
		800	0 0
„ BALANCE, to Revenue and Expenditure Account.	7,780	19	3

£11,085 2 4

Dr.

WISLEY GARDENS—BALANCE

LIABILITIES.

	£	s.	d.	£	s.	d.
To CAPITAL FUNDS ACCOUNT—						
As at 31st December, 1922	34,999	10	8			
Add Amount contributed by R.H. Society, 31st December, 1923		72	8			
				35,071	18	10
„ ENDOWMENT TRUST FUND				28,972	7	11
(The difference between this Fund and the Investment Account on the Assets side is due to a change in the Investments which was made in 1921.)						
„ DEPRECIATION AND RENEWALS RESERVE FUND—						
As at 31st December, 1922	4,971	18	3			
Added, 1923		130	1			
				5,101	19	3

£69,146 6 0

ASSETS.

By DWELLING HOUSES—	£	s.	d.	£	s.	d.
As at 31st December, 1922	5,651	17	4			
„ GLASS HOUSES, RANGES, POTTING SHEDS, &c.—						
As at 31st December, 1922	5,202	6	0			
„ LABORATORY—						
As at 31st December, 1922	20,623	18	2			

31,478 1 6

N.B.—The Hanbury Trust Estate is, under the Trust Deed, vested in the Society only so long as it is in the position to use it as an Experimental Garden. The value of the expenditure thereon depends therefore on the continued use of the Garden by the Society.

„ STOCK FUEL				120	0	0
„ MOTOR CAR AND LORRY	809	3	0			
Less Depreciation	299	0	0			

510 3 0

„ INVENTORY OF PLANT AND LOOSE EFFECTS (as taken by Mr. Chittenden)—						
Gardens and Laboratory	1,744	17	8			
Farm	1,313	17	6			

3,058 15 2

„ LIBRARY				283	11	10
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INVESTMENT OF DEPRECIATION AND RENEWALS

RESERVE ACCOUNT—

5 % War Loan, 1929-47 . £2,481 8 9 cost	2,377	5	11
3½ % War Loan, 1925-28 . £395 18 11 „	346	9	0
3½ % Conversion Loan, 1961, £342 18 2 „	260	2	0
5 % London Cnty. Stk. 1940-60 £785 5 3 „	661	13	6
2½ % Met. Cons. Stk. 1919-49 £1,287 9 2 „	662	19	3
2½ % Plymouth Cor. Red. Stock 1918-58 . £288 8 10 „	142	1	0
6 % Plymouth Cor. Red. Stock 1940-50 . £159 18 4 „	151	12	4
2½ % Bristol Cor. Red. Stk. 1957 . £795 14 6 „	369	15	3

4,971 18 3

Add Cash for Investment 130 1 0

5,101 19 3

„ ENDOWMENT TRUST FUND INVESTMENTS—

5 % War Loan, 1929-47, £9,350 cost	8,972	7	11
3½ % Conversion Loan, 1961 £2,484/4/1 „	2,000	0	0
5 % London County Stk., 1940-60 £600 „	505	12	0
3½ % London County Cons. Stk. £135/8/4 „	130	0	0
2½ % Met. Cons. Stk., 1919-49 £970 „	499	12	0
6 % Ply. Cor. Red. Stk., 1940-50. £30/9/4 „	29	6	4
2½ % Ply. Cor. Red. Stk., 1918-58 £400 „	197	1	0
2½ % Bristol Cor. Deb. Red. Stk., 1957 £600 „	278	18	6
London & North Eastern Rly. 4 % Deb. Stock	£3,500		
Can. Pac. Ry. 4 % Per. Cons. Deb. Stk. £4,632 „	3,535	0	0
Buenos Ayres Gt. S. Rly. 5 % Non-Cum. Pf. Stk.	£2,500		
City of Moscow Loan, 1912, 4½ % Bonds	£6,000		

28,593 15 3

(In common with most pre-war Securities, the above have, for sale purposes, depreciated, but for revenue purposes they bring in the same income as before, less interest on the City of Moscow Loan, upon which no dividend has been received during the year.)

£69,146 6 0

I have audited the books from which the foregoing Accounts are compiled, and certify that they exhibit a true and correct statement of the position on the 31st December, 1923.

ALFRED C. HARPER, F.C.A., Auditor

(HARPER BROS. & FEATHER, Chartered Accountants),

35 Great Tower Street, London. E.C. 3.

22nd January, 1924.

Dr.

ALFRED DAVIS

Bequeathed to the Society in 1870 for Annual Prizes

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1922	946	0	3			
	<u>946 0 3</u>					
„ Dividends received 1923				53	7	9

WILLIAMS

Raised by Donations in 1891 in Memory of

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1922	204	2	5			
	<u>204 2 5</u>					
„ Balance 31st December, 1922				69	16	4
„ Dividends received 1923				8	0	7
				<u>77 16 11</u>		

MASTERS

Raised by Donations in 1908 in Memory of Dr. Masters

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1922	542	17	0			
	<u>542 17 0</u>					
„ Balance 31st December, 1922				127	19	5
„ Dividends received 1923				20	0	0
				<u>147 19 5</u>		

NICHOLSON

Raised by Donations in 1908 in Memory of

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1922	180	14	4			
	<u>180 14 4</u>					
„ Dividends received 1923				7	8	1

SCHRÖDER

Provided by the Royal Horticultural Society in Memory of the late Baron

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1922	557	14	6			
	<u>557 14 6</u>					
„ Balance 31st December, 1922				6	6	8
„ Dividends received 1923				20	0	0
				<u>26 6 8</u>		

TRUST FUND.

Cr.

or in any other way the Council may determine.

	£	s.	d.	£	s.	d.
By London County 5 % Stock, 1940-60, £375 . . .	316	0	0			
„ Met. Consd. 2½ % do. 1919-40, £610 . . .	314	4	0			
„ Plymouth Corpn. 2½ % Red. Stk., 1918-53, £200	98	10	6			
„ do. 6 % do. 1940-50, £32 7 4	31	2	3			
„ Bristol Corpn. 2½ % do. 1957, £400 . . .	186	3	6			
	<u>946</u>	<u>0</u>	<u>3</u>			
„ Revenue and Expenditure Account . . .				53	7	9

MEMORIAL FUND.

B. S. Williams towards Prizes and Medals.

	£	s.	d.	£	s.	d.
By East India Railway Co. Annuity, Class B £7 . . .	168	0	0			
„ New South Wales Government 4 per cent. Inscribed Stock (1942-62) £36 3s. 1d.	36	2	5			
	<u>204</u>	<u>2</u>	<u>5</u>			
„ Balance in hands of R.H. Society . . .				77	16	11
				<u>77</u>	<u>16</u>	<u>11</u>

MEMORIAL FUND.

towards the Provision of one or more Annual Lectures.

	£	s.	d.	£	s.	d.
By London Midland & Scottish 4 % Preference Stock, £250	290	13	6			
„ London Midland & Scottish 4 % Guaranteed Stock, £250	252	3	6			
	<u>542</u>	<u>17</u>	<u>0</u>			
„ Balance in hands of R.H. Society . . .				147	19	5
				<u>147</u>	<u>19</u>	<u>5</u>

MEMORIAL FUND.

George Nicholson for Prizes to Wisley Students.

	£	s.	d.	£	s.	d.
By Local Loans, 3 %, £31 11s. 0d.	20	1	5			
„ Tasmanian Government 4 per cent. Inscribed Stock 1940-50, £162 4s. 5d.	160	12	11			
	<u>180</u>	<u>14</u>	<u>4</u>			
„ Prizes				5	10	0
„ Wisley Laboratory Prize Fund				1	18	1
				<u>7</u>	<u>8</u>	<u>1</u>

PENSION.

Schröder to pay to Gardeners' Royal Benevolent Institution for one Pension.

	£	s.	d.	£	s.	d.
By Great Western Railway 4 per cent. Debenture Stock £500.	557	14	6			
„ Gardeners' Royal Benevolent Institution . . .				20	0	0
„ Balance in hands of R.H. Society . . .				6	6	8
				<u>26</u>	<u>6</u>	<u>8</u>

SCHEDULE OF INVESTMENTS.

31st December, 1923.

		£	s.	d.
5 % War Loan (1929-1947) £9,712 10s. 6d.	cost	9,440	2	11
3½ % War Loan (1925-1928) £4,998 16s. 0d.	„	4,363	16	9
3½ % Conversion Loan (1961) £6,399 12s. 4d.	„	5,000	0	0
3 % Local Loans £5,800	„	6,006	16	6
2½ % India Stock £186 9s. 9d.	„	109	2	2
3½ % Dominion of Canada Registered Stock (1930-1950) £2,000	„	2,000	0	0
5 % London County Stock (1940-1960) £2,114 0s. 9d.	„	1,781	3	2
2½ % Metropolitan Consolidated Stock (1919-1949) £3,462 8s. 10d.	„	1,783	6	7
2½ % Plymouth Corporation Red. Stock (1918-1958) £786 1s. 10d.	„	386	19	7
6 % Plymouth Corporation Red. Stock (1940-1950) £427 13s. 6d.	„	405	5	3
2½ % Bristol Corporation Debenture Red. Stock (1957) £2,096 13s. 6d.	„	974	7	9
4½ % Central Argentine Railway, Limited, Consolidated Preference Stock £2,800	„	2,907	3	6
4 % Central Argentine Railway, Limited, Debenture Stock £600	„	537	15	10
5 % Havana Terminal Railroad Company Mortgage Debenture Bonds £8,300	„	8,946	0	0
		<u>£44,642</u>	<u>0</u>	<u>0</u>

ON ACCOUNT OF GENERAL RESERVE FUND.

		£	s.	d.
5 % War Loan, 1929-47, £19,837 9s. 6d.	cost	19,951	7	9
3½ % Conversion Loan, 1961, £6,606 17s. 5d.	„	5,049	10	0
London & North Eastern Railway 4 % Debs., £5,510 0s. 0d.	„	4,999	2	3
		<u>£30,000</u>	<u>0</u>	<u>0</u>

[See also pp. xi, xv, xvii, xix.]

GENERAL MEETING.

FEBRUARY 26, 1924.

Mr. WILLIAM CUTHBERTSON, J.P., V.M.H., in the Chair.

One hundred and forty-eight Fellows and five Associates were elected, and five Societies affiliated.

A lecture was given by Mr. A. J. Cobb on "The Value of the Modern Dahlia for the Garden and for Cutting" (see vol. 49, p. 139).

GENERAL MEETING.

MARCH 11, 1924.

Dr. A. W. HILL, F.R.S., in the Chair.

One hundred and twelve Fellows and two Associates were elected, and five Societies affiliated.

A lecture was given by Dr. A. C. Seward on "Arctic Vegetation Past and Present" (see p. 1).

GENERAL MEETING.

MARCH 25, 1924.

Mr. C. G. A. NIX, V.M.H., in the Chair.

One hundred and forty Fellows and two Associates were elected, and three Societies affiliated.

A lecture was given by Dr. A. C. Seward on "Plants as Evidence of Climatic Changes" (see p. 1).

GENERAL MEETING.

APRIL 8, 1924.

Mr. GEORGE MONRO in the Chair.

One hundred and nine Fellows and one Associate were elected, and two Societies affiliated.

A lecture was given by Mr. Montagu Allwood on "Carnations."

DAFFODIL SHOW.

TUESDAY and WEDNESDAY, APRIL 15 and 16, 1924.

CHIEF AWARDS.

Class 19.—Twelve varieties, not in commerce.

First Prize, Engleheart Challenge Cup.

To P. D. Williams, Esq., Lanarth, St. Keverne, Cornwall.

Class 22.—Twelve varieties, raised by the Exhibitor.

First Prize, Gold Medal.

To P. D. Williams, Esq.

NON-COMPETITIVE GROUPS.

Gold Medal.

To the Donard Nursery Co., Newcastle, co. Down.

To Messrs. Barr & Sons, King St., Covent Garden.

Silver-gilt Banksian Medal.

To Mr. J. L. Richardson, Prospect House, Waterford.

Silver Banksian Medal.

To Messrs. R. H. Bath, Ltd., Wisbech.
To the Welsh Bulb Fields, St. Asaph.

Bronze Banksian Medal.

To W. F. M. Copeland, Esq., West View, Shirley, Southampton.

The Peter Barr Memorial Cup.

Awarded every year by the Council on the recommendation of the Narcissus Committee to one who, in the Committee's opinion, has done good work of some kind on Daffodils.

Awarded to Mr. J. K. Ramsbottom, 61 Ennerdale Road, Richmond, Surrey.

GENERAL MEETING.

APRIL 29, 1924.

The Rt. Hon. The Lord LAMBOURNE in the Chair.

One hundred and seventy-one Fellows and six Associates were elected, and five Societies affiliated.

DEPUTATIONS.

TRURO SHOW.

MAY 6, 1924.

Award of Merit.

To *Staphylea holocarpa*, shown by Mr. P. D. Williams, Lanarth.

Cultural Commendation.

To Miss S. Wingfield, Pendrea, Penzance, for Tulip Louis XIV. and for *Myosotidium nobile*.

Gold Medal.

To Mr. J. C. Williams, Caerhays Castle, for Rhododendrons.
To Messrs. R. Veitch & Son, Exeter, for a most meritorious exhibit.

Silver-gilt Flora Medal.

To Rev. A. T. Boscawen, Ludgvan, for flowering shrubs.
To Messrs. Treseder & Co., Truro, for a meritorious exhibit.

Silver-gilt Banksian Medal.

To Maj. A. A. Dorrien-Smith, Tresco, for flowering shrubs.

Silver Flora Medal.

To Viscount Falmouth, Tregothnan, for Acacias.
To Mr. F. G. Lawson, Claremont, Truro, for Tulips.
To the Devon Rosery, Torquay, for a meritorious group.

Silver Banksian Medal.

To Mr. A. M. Williams, Werrington Park, Launceston, for flowering Cherries, Evergreen Rhododendrons, and Rhododendrons (Chinese mountain species).

To Viscount Falmouth, for *Camellia reticulata*.

To Mr. R. Barclay Fox, Penjerrick, Falmouth, for flowering shrubs and scented Rhododendrons.

To Mr. H. H. Grigg, Tamerton, for Evergreen Azaleas.

To Mr. C. Phillips, Menehay, Budock, for Anemones.

To Maj. G. T. Williams, Tredrea, Perranwell, for Darwin Tulips.

To Miss Daubuz, Killion, Truro, for Tulips.

To Mrs. G. Powys Rogers, Tregye, Perranwell, for hardy spring flowers.

INTERNATIONAL ORCHID SHOW, BOSTON, U.S.A.

MAY 8, 1924.

Gold Medal.

To A. C. Burrage, Esq., 85 Anne Building, Boston, Mass., U.S.A., for Orchids.

GENERAL MEETING.

MAY 13, 1924.

The Rt. Hon. The Lord LAMBOURNE in the Chair.

One hundred and seventy-five Fellows and nine Associates were elected,
and nine Societies affiliated.

CHELSEA SHOW.

MAY 27-29, 1924.

List of Awards.

CHALLENGE CUPS.

Sherwood Cup, for the most meritorious group.

To Messrs. J. & A. McBean.

"Daily Graphic" Cup, for the best Rock Garden.

To Messrs. T. R. Hayes & Sons.

*Orchid Challenge Cup, for the best exhibit of Orchids by an amateur on a space
not exceeding 60 square feet. Only those were allowed to compete who em-
ployed not more than three assistants in Orchid houses (including the head
gardener).*

To Mr. H. T. Pitt.

SPECIAL CUPS.

Allwood Carnation Bowl, for the best group of Carnations exhibited by an amateur.

To Mr. F. W. Seymour.

Sutton Silver Cup, for the best Amateur exhibit of Vegetables.

To the Hon. Vicary Gibbs (gr. E. Beckett).

ORCHIDS.

Gold Medal.

To Messrs. Charlesworth & Co., for Orchids.

To Messrs. J. & A. McBean, for Orchids.

To Sir Jeremiah Colman, Bt. (gr. J. Collier), for Orchids.

Silver Cup.

To Messrs. Sanders, for Orchids.

Silver-gilt Flora Medal.

To Messrs. Cowan & Co., for Orchids.

To Messrs. J. Cypher & Son, for Orchids.

To H. T. Pitt, Esq., for Orchids.

To Messrs. Stuart Low & Co., for Orchids.

Silver-gilt Banksian Medal.

To J. J. Joicey, Esq. (gr. J. Mackay), for Orchids.

To Messrs. Mansell & Hatcher, for Orchids.

Silver Flora Medal.

To Mr. H. Dixon, for Orchids.

Silver Banksian Medal.

To J. J. Bolton, Esq., for Orchids.

FRUIT AND VEGETABLES.

Gold Medal.

To Hon. Vicary Gibbs (gr. E. Beckett), for vegetables.

Silver Cup.

To Messrs. G. Bunyard & Co., for fruit.

To Messrs. T. Rivers & Sons, for fruit trees in pots.

Silver Hogg Medal.

To Messrs. Laxton Bros., for Strawberries.

To V. C. Vickers, Esq., for Raspberries.

Silver Knightian Medal.

To Messrs. Dobbie & Co., Ltd., for Potatos.

Vote of Thanks.

To Mrs. Radcliff, for Strawberries.

DELPHINIUMS, TULIPS, ETC.

Silver-gilt Flora Medal.

To Messrs. Blackmore & Langdon, for Delphiniums.

To Mr. G. R. Downer, for Lupines.

To Messrs. Dobbie & Co., for Tulips.

Silver-gilt Banksian Medal.

To V. C. Vickers, Esq., for Aquilegias.

Silver Flora Medal.

To Messrs. E. Paul & Co., for Tulips.

To Mr. W. A. Watts, for Tulips.

To Mrs. W. Yandell, for Violas.

To Messrs. Reamsbottom & Co., for Anemones.

Silver Banksian Medal.

To Mr. H. Clarke, for Violas.

SWEET PEAS, DAHLIAS, AND PÆONIES.

Gold Medal.

To Messrs. R. Bolton & Son, for Sweet Peas.

To Messrs. Dobbie & Co., Ltd., for Sweet Peas.

Silver-gilt Flora Medal.

To Messrs. A. Dickson & Sons, Ltd., for Sweet Peas.

Silver-gilt Banksian Medal.

To Messrs. Andrew Ireland & Hitchcock, for Sweet Peas.

Silver Flora Medal.

To Mr. J. Stevenson, for Sweet Peas.

To Messrs. Sutton & Sons, for Sweet Peas.

Silver Banksian Medal.

To Messrs. Carter Page & Co., for Dahlias.

ROCK AND FORMAL GARDENS.

Gold Medal.

To Messrs. T. R. Hayes & Sons, for rock garden.

To Messrs. G. G. Whitelegg, for rock garden.

Silver Cup.

To Mr. James Macdonald, for grass garden.

Silver-gilt Flora Medal.

To Backhouse Nurseries, Ltd., for rock garden.
 To Mr. C. Elliott, for rock garden.
 To Messrs. Pulham & Son, for rock garden.
 To Messrs. W. H. Gaze & Sons, for formal garden.
 To Messrs. J. Cheal & Sons, for formal garden.
 To Messrs. R. Neal & Sons, for formal garden.

Silver-gilt Banksian Medal.

To Messrs. Hodsons, Ltd., for rock garden.
 To Messrs. Kent & Brydon, Ltd., for formal garden.
 To Italia House, for formal garden.

Silver Flora Medal.

To Messrs. W. Cutbush & Son, Ltd., for rock garden.
 To Messrs. J. Carter & Co., for formal garden.
 To Mr. H. Brook, for formal garden.

PRIMULAS.

Silver Flora Medal.

To Dr. Macwatt, for Primulas.

SHRUBS.

Gold Medal.

To Lady Aberconway, for Rhododendrons.
 To Messrs. R. & G. Cuthbert, for shrubs.
 To Messrs. G. Jackman & Son, for Clematis.
 To Mr. R. C. Notcutt, for shrubs.
 To Messrs. Waterer, Sons & Crisp, for shrubs and Rhododendrons.

Silver Cup.

To Messrs. J. Cheal & Son, for shrubs.

Silver-gilt Flora Medal.

To Messrs. A. Charlton & Sons, for shrubs.
 To Messrs. Fromow & Sons, for shrubs.
 To Messrs. E. Hillier & Sons, for shrubs.
 To Messrs. M. Koster & Sons, for Rhododendrons.
 To Mr. R. Reuthe, for shrubs.
 To Messrs. L. R. Russell, Ltd., for ornamental trees and shrubs.
 To Messrs. R. Wallace & Co., for Rhododendrons, Azaleas, etc.

Silver-gilt Banksian Medal.

To Donard Nursery Co., for shrubs.
 To Yokohama Nursery Co., for Japanese trees.
 To Mr. J. Klinkert, for Topiary.

Silver Flora Medal.

To Messrs. W. Cutbush & Sons, for shrubs.
 To Messrs. Fletcher Bros., for shrubs.
 To Mr. T. Lewis, for Rhododendrons, etc.

Silver Banksian Medal.

To Messrs. R. Gill & Son, for shrubs.
 To Messrs. R. Green, Ltd., for bay trees.
 To Orpington Nurseries, for shrubs.
 To Sir Arthur Vivian (gr. A. A. Cavanagh), for shrubs.
 To Messrs. W. Watson & Sons, for shrubs.
 To Mr. G. G. Whitelegg, for shrubs.

MIXED GROUPS.

Gold Medal and Congratulations.

To Messrs. R. Wallace & Co., for mixed group.

Silver Cup.

To Messrs. G. Bunyard & Co., for mixed group.

To Messrs. W. H. Rogers & Son, Ltd., for mixed group.

To Mr. F. G. Wood, for mixed group.

Silver-gilt Flora Medal.

To Messrs. Bees, Ltd., for mixed group.

To Messrs. J. Cheal & Sons, for mixed group.

To Mr. Amos Perry, for mixed group.

Silver-gilt Banksian Medal.

To Mr. J. C. Allgrove, for mixed group.

To Messrs. Bakers, Ltd., for mixed group.

To Messrs. Barr & Sons, for mixed group.

To Messrs. G. Jackman & Sons, for mixed group.

To Messrs. M. Prichard & Sons, for mixed group.

To Orpington Nurseries, for mixed group.

To Mr. G. G. Whitelegg, for Irises.

To Messrs. Storrie & Storrie, for mixed group.

Silver Flora Medal.

To Messrs. R. H. Bath, Ltd., for mixed group.

To Messrs. Oliver & Hunter, for mixed group.

To Messrs. Waterer, Sons & Crisp, for mixed group.

Silver Banksian Medal.

To Messrs. Godfrey & Son, for mixed group.

To Messrs. Hewitt & Co., for mixed group.

To Maytham Gardens, for mixed group.

To Messrs. Carter Page & Co., for mixed group.

To Mr. R. Reuthe, for mixed group.

To Mr. T. Carlile, for mixed group.

To Messrs. Harkness & Sons, for mixed group.

To Mr. E. Scaplehorn, for mixed group.

To Mr. C. Turner, for mixed group.

To Mr. W. Wells, jun., for mixed group.

VARIOUS.

Gold Medal.

To Messrs. Blackmore & Langdon, for Begonias.

Silver Cup.

To Mr. Sidney Smith, for Cacti.

Silver Flora Medal.

To Messrs. R. J. Bastin & Son, for Begonias.

To Miss Worth, for Succulents.

Silver Banksian Medal.

To Mr. H. N. Ellison, for Cacti.

ROSES.

Gold Medal.

To Messrs. A. J. & C. Allen, for Roses.

Silver Cup.

To Mr. Elisha Hicks, for Roses.

Silver-gilt Flora Medal.

To Messrs. B. R. Cant & Sons, for Roses.
To Mr. W. E. Chaplin, for Roses.

Silver-gilt Banksian Medal.

To Messrs. F. Cant & Co., for Roses.

Silver Flora Medal.

To Messrs. W. Cutbush & Sons, for Roses.
To Messrs. E. Paul & Co., for Roses.

Silver Banksian Medal.

To Mr. George Prince, for Roses.

ALPINES.

Gold Medal.

To Messrs. R. Tucker & Sons, for alpine plants.

Silver Cup.

To Messrs. Clarence Elliott, Ltd., for alpine plants.
To Messrs. M. Prichard & Sons, for alpine plants.

Silver-gilt Flora Medal.

To Messrs. Bowell & Skarratt, for alpine plants.

Silver-gilt Banksian Medal.

To Messrs. Waterer, Sons & Crisp, for alpine plants.
To Messrs. Maxwell & Beale, for alpine plants.
To Messrs. Prichard & Co., for alpine plants.
To Messrs. Skelton & Kirby, for alpine plants.

Silver Flora Medal.

To Messrs. Jones & Ingwersen, for alpine plants.
To Mr. G. G. Whitelegg, for alpine plants.

Silver Banksian Medal.

To Mr. H. Hemsley, for miniature alpine garden.
To Messrs. Laird & Dickson, for alpine plants.

Bronze Flora Medal.

To Messrs. K. & E. Hopkins, for alpine plants.
To Sheppard's Sawhurst Nursery, for alpine plants.

CARNATIONS.

Gold Medal.

To Messrs. Allwood Bros., for Carnations.
To Mr. C. Engelmann, for Carnations.

Silver-gilt Flora Medal.

To Mr. James Douglas, for Carnations.
To Messrs. Stuart Low & Co., for Carnations.

Silver Flora Medal.

To Lt.-Col. the Hon. George Herbert, for Carnations.
To Messrs. Luxford, Keith & Co., for Carnations.
To Mr. F. W. Seymour, for Carnations.
To Mr. C. H. Herbert, for Pinks.

HYDRANGEAS, STOVE AND GREENHOUSE PLANTS.

Gold Medal.

To Mr. H. J. Jones, for Hydrangeas.
To Messrs. L. R. Russell, Ltd., for stove and greenhouse plants.
To Messrs. Sutton & Sons, for flowering plants.

Silver Cup.

To Messrs. J. Carter & Co., for flowering plants.

Silver-gilt Flora Medal.

To H. B. Brandt, Esq., for Caladiums.

To Messrs. J. Peed & Son, for stove and greenhouse plants.

To Messrs. R. Green, Ltd., for Palms.

Silver-gilt Banksian Medal.

To Mr. Alfred Dawkins, for Schizanthus.

To Baron B. Schröder, for Schizanthus and Calceolarias.

To Messrs. Watkins & Simpson, Ltd., for Schizanthus.

Silver Flora Medal.

To Messrs. Stuart Low & Co., for greenhouse plants.

To Messrs. E. Webb & Son, for greenhouse plants.

To Messrs. Wm. Cutbush & Son, for Hydrangeas.

Silver Banksian Medal.

To Messrs. Godfrey & Son, for Pelargoniums and Lupines.

To Maytham Gardens, for Hydrangeas.

Vote of Thanks.

To Mr. R. J. Case, for Pelargoniums.

EDUCATION AND INFORMATION TENT.

In addition to a large exhibit illustrating work at Wisley, the following exhibits were in the Education and Information Tent :—

Silver-gilt Banksian Medal.

To East Malling Research Station.

Silver Banksian Medal.

To Leeds University.

Bronze Banksian Medal.

To Cambridge Botany School.

To Mr. James Macdonald, for grasses.

To Ministry of Agriculture, Harpenden.

GENERAL MEETING.

JUNE 11, 1924.

Mr. C. T. MUSGRAVE in the Chair.

Three hundred and fifty-seven Fellows and six Associates were elected, and three Societies affiliated.

A lecture was given by Mr. E. A. Bowles on "Uncommon and Interesting Plants."

GENERAL MEETING.

JUNE 24, 1924.

Mr. R. W. ASCROFT in the Chair.

Forty-six Fellows were elected, and two Societies affiliated.

A lecture was given by Mr. W. J. Dowson, M.A., on "Gardening in the Highlands of Kenya Colony."

SCIENTIFIC COMMITTEE.

JANUARY 15, 1924.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, twelve members and Mrs. MARTINEAU and Mr. JENNINGS (visitors) present.

Bud sports from roots.—Dr. Bateson showed a *Pelargonium* of the "marbled" type in which a core of albino tissue is overlaid by green. A plant of this was planted in an inverted position, and buds had developed from the roots, all of them completely albino. The buds develop from the central tissue of the root, and therefore contain no green tissue.

Clivia Gardenii.—Mrs. Martineau showed a plant of this uncommon species in flower. It is figured in the *Botanical Magazine*.

Primula obconica varieties.—Mr. Jennings showed a considerable range of varieties of *Primula obconica*, varying much in shade, size, and degree of fimbriation of margins of petals. In some cases the flowers were very large.

Orobanches and *Lathraea*.—Mr. Fraser showed British specimens of *Orobanche elatior* growing on *Centaurea* and of *O. minor* and *Lathraea squamaria*, together with a lemon-coloured variety of the last, collected by Mr. E. B. Green at Harewood, Middlesex.

Eggs of Yellow Underwing.—Mr. Chittenden showed on behalf of Mr. G. F. Wilson a photograph of a horse hair on which the Yellow Underwing had laid its eggs, instead of upon grass stems as it usually does.

SCIENTIFIC COMMITTEE, JANUARY 22, 1924.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and seven members present.

Malformed Cyclamen persicum.—Mr. Preston showed a flower of *Cyclamen persicum* with the petals beyond the normal in number and with anthers petaloid.

Seeds of Physalis ixocarpa.—Mr. Bowles exhibited seeds of the 'Tomatello' *Physalis ixocarpa*.

British rushes.—Mr. J. Fraser showed dried specimens of most of the British species of *Juncus* collected from wild sources, and described their distinguishing features.

SCIENTIFIC COMMITTEE, FEBRUARY 12, 1924.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and nine members present.

Cones of Pines.—Mr. Fraser showed immature cones of *Pinus patula* from Cornwall, and remarked upon the tree growing at Wisley, an unusual tree for such a bleak climate as Wisley has. He also showed a cone of *Pinus Thunbergii*, which often fruits in this country.

Uncommon orchids.—Mr. G. Wilson showed a specimen of *Spiranthes aestivalis* which had come up in some sphagnum in the garden of Mr. Rickards at Usk on Wye, possibly imported from the New Forest. He also showed a specimen of the Punch and Judy Orchid, *Gongora purpurascens*.

Beetles attacking Lettuce.—Mr. Poupart sent some larvæ attacking recently transplanted cos-lettuce, and these have since been identified as those of the turnip mud beetle.

Leontice altaica and *Lopezia* were sent for naming.

Crocuses.—Mr. Bowles showed several interesting *Crocuses*, including the form raised by Mr. Edelsten by crossing the Cretan with the normal form of *Crocus Sieberi* and called Hubert Edelsten, a form of *C. chrysanthus* found by Mr. Maw on the Bithynican Olympus, and seedlings of *chrysanthus* called 'Bullfinch' and 'Moonlight,' the latter raised by Mr. van Tubergen. He also showed a seedling of *C. aureus* with bronzed markings on the backs of the segments, and remarked that the bluest of *Crocuses*, often called *C. tauri*, is perhaps really *C. Adami*, collected by Siene.

Eranthis × *Tubergeni*, a hybrid between *C. hyemalis* and *C. cilicus*, was also shown by him.

SCIENTIFIC COMMITTEE, FEBRUARY 26, 1924.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and eight members present.

Lilium Martagon.—Mr. Fraser showed dried specimens of *Lilium Martagon* collected from a wild source near Reigate, where it was recorded by Brewer as occurring as long ago as 1852. Mr. Fraser remarked that, owing to various causes, especially to the transplanting of roots into gardens, and the prevention of seeding by the cutting of the flowers in bud, the plant is now rapidly diminishing.

Pollination of Aspidistra lurida.—Mr. Dowson showed flowers and diagrams, also microphotographs of stigmas, etc., of the common *Aspidistra*. He remarked that slugs and snails were usually regarded as the pollinating agents of this flower, but that he had found that small insects, such as *Collembola* and Thrips, and mites, were frequent in the flowers and became covered with pollen, which as they crawled over the stigmas was deposited thereon.

Pelargonium sports and varieties.—Mr. Hosking showed a specimen of *Pelargonium* with lacinated petals, and a drawing of the plant, from a correspondent in N. S. Wales. The drawing suggested that the plant might be a form of a Zonal *Pelargonium*.

He also showed a specimen of a commonly cultivated *Pelargonium* with small, rather crumpled, white-edged leaves, which never in that form produced flowers, but which gave rise occasionally to a sport with normally expanded green leaves and much more vigorous, which flowered, producing flowers with very narrow petals. The botanical origin of this form appears doubtful.

Long-styled form of Primrose.—Mr. Hosking also showed a form of *Primrose* in which the style, even in the bud, was so long that it protruded beyond the tips of the still closed petals.

'*Witches' Broom*' on *Prunus subhirtella autumnalis*.—Mr. Grigg sent a specimen of *Prunus subhirtella autumnalis* with growth resembling that known as 'Witches' Broom' from a tree in his garden about sixteen feet in height. The growth was similar to that previously shown from Mr. P. D. Williams' garden at Lanarth, but, unlike the latter, flowers had been produced with fair freedom upon this.

Axial proliferation in Actinostrobus.—Mr. Preston showed shoots of *Actinostrobus* in which the vegetative growth was continued beyond the portion of the shoot upon which young cones had been produced.

SCIENTIFIC COMMITTEE, MARCH 11, 1924.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and five members present.

Gentiana Amarella and vars.—Mr. Fraser showed specimens of *Gentiana Amarella* 15 inches in height from Warlingham, and a new form which had been placed under *Gentiana lingulata* but which is very similar to *G. Amarella*. It grows on high rocks near the sea at Swanage, has four lobed corolla, and is early flowering.

SCIENTIFIC COMMITTEE, MARCH 25, 1924.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and eight members present.

Root of Sassafras.—Mr. Fraser showed a piece of the root of *Sassafras officinalis*, to draw attention to the great size of the vessels of the wood of this root; they are easily seen with the naked eye. The plant is very difficult to transplant, for earth fails to adhere to the roots on lifting, but whether this difficulty is in any way correlated with the large vessels does not appear to be known.

Cones of Spruce.—Mr. Fraser also showed cones of *Picea Morinda* and *P. sitchensis*, and made some remarks upon the trees, both of which are commonly grown in this country.

The Kumquat.—Mr. Hales showed fruits of Kumquat, which are for sale in the West End shops. The particular form exhibited is the oblong one, known as *Fortunella marginata*.

Germination of Fern prothalli.—Mr. Hales also drew attention to the failure of fern spores to grow upon fibre, although the same spores grew well upon soil adjacent to it. Mr. Arkwright said that he had found a soil composted according to an old recipe, and consisting largely of thoroughly decayed leaf mould, from an old wood, far superior to anything else for the germination of the seeds of the *Viola*.

Coloured Primroses.—Mr. Arkwright showed a very fine red Primrose of very pure colour, which, however, became bluish in certain circumstances. The plant is weak, unfortunately.

Jack-in-the-green Primroses.—A series of various colours of Jack-in-the-green Primroses came from Mr. Corbett of Guernsey. He gave the history of them, from which it appeared that a chance seedling of the large calyxed form was one of the parents of them all. He said that they set seed less freely than do the common Primroses.

SCIENTIFIC COMMITTEE, APRIL 8, 1924.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, five other members and Mr. VAN DER WEYER (visitor) present.

Various plants.—Mr. Van der Weyer showed *Ophrys bombylifera* from Portugal; *Haemanthus filiflorus*, which has extremely narrow segments to its flowers, from British East Africa; and a species of *Craterostigma* from Mt. Kenya, where it grows at an elevation of 5,000 feet.

Fern prothalli.—Mr. Hales showed the fern prothalli which were referred to at the last meeting. The growth was vigorous and abundant upon the sterilized soil, but had only just begun upon the unsterilized fibre in pots kept under the same conditions in all respects.

Dialysis in Narcissus.—Mr. Preston showed the flower of a *Narcissus* with the tube cut down to the base, so that the segments were free to their point of origin at the top of the ovary, and the parts of the corona were also free.

Double Daffodils becoming single.—Mr. Van der Weyer said that he found some plants of the double *Narcissus cernuus* which he had planted in his garden had this year produced single flowers. It will be interesting to see whether this is the case next year.

Fasciated Anemone.—Mr. Holmes sent an example of a fasciated flower of *Anemone coronaria*, making a very double flower.

British plants.—Mr. Fraser showed specimens of the rare British umbelliferous plant *Physospermum cornubiense*, and also of *Daucus gummifer*, from Swanage, with *D. Carota* for comparison.

SCIENTIFIC COMMITTEE, APRIL 29, 1924.

Mr. W. CUTHBERTSON, V.M.H., in the Chair, and nine other members present.

British Thistles.—Mr. J. Fraser showed a series of dried specimens of British thistles, all British species being represented except *Cnicus tuberosus*.

Various Plants.—Mr. Marsden Jones showed *Pulmonaria angustifolia* in several forms which he had found growing wild, including a pale blue one and one with very small flowers. He also showed a deep purplish form of *Anemone nemorosa* with the deep coloration persistent from youth to age. He showed also a primrose with a raised ridge along the middle of each petal.

Primulas.—Mr. Hosking showed *Primula saxatilis* and a form of *P. denticulata*.

SCIENTIFIC COMMITTEE, MAY 13, 1924.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and nine other members present.

Pulmonaria sp.—Mr. Fraser showed examples of *Pulmonaria angustifolia* in a large-flowered form from Hinton, and of *P. officinalis*.

Rumex.—He also showed specimens of *Rumex Acetosella* and *R. Acetosella*.

Breaking of Tulips.—Mr. Jacob showed a 'broken' form of *Tulipa Clusiana*, and Mr. Jardine made some remarks upon the form and colour of the base of tulips varying with cultural methods, which did not meet with unanimous concordance.

Pelargonium sporting, etc.—Mr. Hosking showed a sporting form of the Ivy-leaved Pelargonium which was not recognized. He also showed a rose form of *Arabis albida* and *A. rosea*.

Double spathe in Spathycarpa.—Mr. Hales showed a double-spathed form of *Spathycarpa sagittaeifolia*.

Tulip Crosses.—Mr. Marsden Jones showed a long series of crosses made by him between various tulips, illustrating the variation to be obtained by such crossing. A Certificate of Appreciation was unanimously recommended on the motion of Mr. Hales, seconded by Mr. Odell.

Branched tulip.—A fine example of a branched Darwin tulip was sent by Mrs. Alfred Kerr. Branching of tulips varies from year to year according to the conditions precedent, but this year it appears to be on the whole very marked.

SCIENTIFIC COMMITTEE, MAY 27, 1924.

AT CHELSEA.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and six other members present, with Mr. LOTHOUSE (visitor).

Violas.—Mr. Lofthouse showed a series of forms of *Viola lutea*, including the variety *gracilescens*, all of which he had collected from their wild habitat in Teesdale.

Polygonatum multiflorum var.—Mr. Hales showed a curious branched Polygonatum having the flowers on the branches, which also bore leafy bracts.

Delphinium aberrant.—Mr. Chittenden showed an aberrant Delphinium in which on one growth long single-flowered branches had been produced, each with a bract just beneath the flower, giving the appearance of a leaf terminating in a flower.

Various plants.—Mr. Marsden Jones showed *Papaver nudicaule* with foliaceous sepals, persistent; a hybrid Pentstemon with a blue-flowered form as one of the parents; and Miss King's var. of *Cheiranthus*, sometimes called 'Newark Park' (*versicolor* × *Allioni*).

SCIENTIFIC COMMITTEE, JUNE 11, 1924.

Mr. J. W. ODELL in the Chair, and seven other members present.

Archangelica officinalis.—Mr. Fraser showed specimens of this plant collected at Isleworth and Putney.

Salix Caprea var.—Mr. Fraser also showed specimens of a *Salix* which had been described as *Salix lanata* by Haller, but which is actually a form of *Salix Caprea*. There is a tree at Finlariig Castle 40 feet high.

Various plants.—Mr. Hosking showed various plants, among them *Achillea macrophylla*, *Salvia sp.*, *Veronica pinnatifida*, *Hypericum sp.*, all grown from seed collected in Salonika. He also showed a form of *Rosa rugosa*.

Violet diseased.—Mr. Odell showed *Viola* attacked by the violet smut, *Urocystis Violae*.

Actinidia.—Mr. Loder showed foliage of *Actinidia Kolomihta*, the foliage being white at first, then pink, but variegated only on the upper surface, the lower being green.

Virescence in Geum.—Mr. Christy showed virescent flowers of *Geum coccineum* in which petals and stamens were all foliaceous.

Iris hybrids.—Mr. A. Perry showed a large number of crosses between *Iris chrysographes*, *I. Bulleyana*, *I. Wilsoni*, and allied species. The Committee unanimously recommended the award of a Certificate of Appreciation to Mr. Perry.

FRUIT AND VEGETABLE COMMITTEE.

JANUARY 15, 1924.

Mr. C. G. A. Nix, V.M.H., in the Chair, and sixteen members present.

Award Recommended :—

Silver-gilt Knightian Medal.

To Messrs. Sutton, Reading, for vegetables.

Other Exhibits.

Messrs. Geo. Bunyard, Maidstone : Apples in season.

Mrs. Miller, Marlow : preserves.

Messrs. Westmacott, London : preserves.

Miss D. Carter, Peasmarsh : preserves.

FRUIT AND VEGETABLE COMMITTEE, JANUARY 29, 1924.

Mr. J. CHEAL, V.M.H., in the Chair, and thirteen members present.

Awards Recommended :—

Silver Hogg Medal.

To Messrs. J. C. Allgrove, Langley, for collection of Apples.

Apple 'Ribston Pearmain,' from Mr. N. Fullegar, Eastbury Manor Gardens, Compton, was recommended for inclusion in the Commercial Fruit Trials at Wisley.

Other Exhibits.

Messrs. Geo. Bunyard, Maidstone : collection of Apples in season.

C. Huggins, Esq., Credenhill : Apple 'Gilbey's Seedling.'

Miss H. G. Sewell, South Kensington : preserves.

Mrs. Miller, Marlow : preserves.

Miss D. Carter, Peasmarsh : preserves.

FRUIT AND VEGETABLE COMMITTEE, FEBRUARY 12, 1924.

Mr. C. G. A. Nix, V.M.H., in the Chair, and twenty-one members present.

Awards Recommended :—

Silver-gilt Hogg Medal.

To Messrs. Rivers, Sawbridgeworth, for Citrus fruits in pots.

Silver Knightian Medal.

To Messrs. Sutton, Reading, for vegetables.

Other Exhibits.

Messrs. Geo. Bunyard, Maidstone : collection of Apples in season.

Messrs. J. Cheal, Crawley : Apple 'Crawley Beauty.'

Messrs. Shearn, London : imported fruits.

A. Seth-Smith, Esq. (gardener, Mr. J. Quartermain), Cobham : seedling Orange.

FRUIT AND VEGETABLE COMMITTEE, FEBRUARY 26, 1924.

Mr. C. G. A. Nix, V.M.H., in the Chair, and twenty-two members present.

Awards Recommended :—

Silver-gilt Knightian Medal.

To Messrs Sutton, Reading, for vegetables.

Bronze Hogg Medal.

To Messrs. Shearn, London, for imported fruits.

Other Exhibits.

Messrs. Geo. Bunyard, Maidstone : collection of Apples in season.

Messrs. Miller, Wisbech : Rhubarb 'The Sutton.'

FRUIT AND VEGETABLE COMMITTEE, MARCH 11, 1924.

Mr. J. CHEAL, V.M.H., in the Chair, and sixteen members present.

Award Recommended :—

Silver Hogg Medal.

To Messrs. Shearn, London, for imported fruits.

Other Exhibits.

Messrs. Geo. Bunyard, Maidstone : collection of Apples in season.

Messrs. R. F. Felton, Hanover Square : Peach for identification.

The recommendations made by the sub-committee visiting Wisley to judge the trial of Kales were confirmed.

Award of Merit. (Especially for growing in small gardens.)

2. 'Cottager's,' sent by Messrs. W. H. Simpson & Sons, Birmingham.

24. 'New Winter,' sent by Messrs. Dickson & Robinson, Manchester.

Highly Commended.

31. 'Tall Curled,' sent by Messrs. Toogood, Southampton.

33. 'Tall Green Curled,' sent by Messrs. Nutting, London.

35. 'Westland,' sent by Messrs. Zwaan & de Wiljes, Scheemda, Holland.

41. 'Northern Plume,' sent by Messrs. D. T. Brown & Co., Boulton-le-Fylde, Lancs.

Commended.

38. 'Moss Curled Exhibition,' sent by Messrs. Barr & Sons, London.

FRUIT AND VEGETABLE COMMITTEE, MARCH 24, 1924.

Mr. C. G. A. NIX, V.M.H., in the Chair, and twenty-two members present.

Award Recommended :—

Silver Knightian Medal.

To Messrs. Sutton, Reading, for vegetables.

Other Exhibit.

Messrs. Geo. Bunyard, Maidstone : collection of Apples in season.

FRUIT AND VEGETABLE COMMITTEE, APRIL 8, 1924.

Mr. C. G. A. NIX, V.M.H., in the Chair, and twenty members present.

No awards were recommended on this occasion.

Exhibits.

Messrs. Bunyard, Maidstone : collection of Apples in season.

C. Williams, Esq., Churston Ferrers : Citrus for identification.

FRUIT AND VEGETABLE COMMITTEE, APRIL 29, 1924.

Mr. J. CHEAL, V.M.H., in the Chair, and twenty members present.

No awards were recommended on this occasion.

Exhibits.

Lt.-Col. Howard Bury, D.S.O., London : fruits of *Cyphomandra Betaceae*.

Sir John Ramsden, Gerrard's Cross : Apples from Kenya Colony.

FRUIT AND VEGETABLE COMMITTEE, MAY 13, 1924.

Mr. C. G. A. NIX, V.M.H., in the Chair, and nineteen members present.

No awards were recommended on this occasion.

Exhibits.

New Zealand Fruit Growers' Federation : collection of Apples.
Messrs. Waterer, Sons and Crisp, Twyford : Strawberries.

FRUIT AND VEGETABLE COMMITTEE, MAY 27, 1924.

AT CHELSEA.

Mr. J. CHEAL, V.M.H., in the Chair, and twenty-one members present.

No awards were recommended on this occasion.

Exhibits.

V. C. Vickers, Esq., Royston : Raspberries 'Newsells Amber' and 'Viking' (recommended for trial at Wisley).

FRUIT AND VEGETABLE COMMITTEE, JUNE 11, 1924.

Mr. J. CHEAL, V.M.H., in the Chair, and nine members present.

No awards were recommended on this occasion.

Exhibits.

New Zealand Fruit Growers' Federation : collection of Apples.

FRUIT AND VEGETABLE COMMITTEE, JUNE 24, 1924.

Mr. C. G. A. NIX, V.M.H., in the Chair, and seventeen members present.

Awards Recommended :—

Silver Hogg Medal.

To Messrs. Laxton, Bedford, for Strawberries.

Silver Knightian Medal.

To Messrs. Barr, Covent Garden, for vegetables.

To Messrs. Carter, Raynes Park, for Lettuce.

Silver Bunyard Medal.

To Sir Chas. Nall-Cain, Bt. (gr. Mr. Pateman), Hatfield, for Strawberries.

Other Exhibits.

G. T. Davies, Esq., East Molesey : Strawberries.

FLORAL COMMITTEE.

JANUARY 15, 1924.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and sixteen members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Blackmore & Langdon, Bath, for Cyclamen.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Cutbush, Barnet, for rock garden.

To Messrs. Paul, Waltham Cross, for Camellias.

To Messrs. Russell, Richmond, for greenhouse plants.

Bronze Banksian Medal.

To Messrs. Cuthbert, Southgate, for Freesias, etc.

To Mr. C. Engelmann, Saffron Walden, for Carnations.

To Hon. Vicary Gibbs, Elstree, for Poinsettias.

To Mr. G. Reuthe, Keston, for conifers and shrubs.

To Messrs. Skelton & Kirby, Pirbright, for hardy plants.

To Messrs. S. Low, Enfield, for Carnations and other greenhouse plants.

To Mr. F. G. Wood, Ashted, for hardy plants.

Silver-gilt Grenfell Medal.

To Sir Hubert Maxwell, for paintings.

Silver Grenfell Medal.

To Mrs Miller, for paintings.

To Miss G. Dorrien-Smith, for paintings.

Award of Merit.

To Chrysanthemum ' H. W. Rieman ' (votes unanimous), from Messrs. Wells, Merstham. A late, deep golden yellow, incurved Decorative Chrysanthemum of good size and excellent form.

Other Exhibits.

Mr. W. Brown, Mayfield : Chrysanthemum ' Mayfield Sunrise.'

Mr. G. Carpenter, Byfleet : Carnation ' Freddie Ward.'

Mr. A. S. Dunton, Wolverhampton : Chrysanthemum ' Chamois.'

Misses Hopkins, Shepperton : hardy plants.

Mr. Klinkert, Richmond : clipped Box trees.

Messrs. Carter Page, London : hardy plants.

Rev. B. Pinney, Durweston : Violets.

Mrs. Turnbull, Torquay : miniature gardens.

Messrs. Carlton White, London : vases of flowers.

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Section B.

Mr. W. J. BEAN, V.M.H., in the Chair, and thirteen members present.

No awards were recommended on this occasion.

Exhibits.

Lady Aberconway and the Hon. H. D. McLaren, Bodnant : *Rhododendron scintillans*.

Mrs. Martineau, Sunningdale : *Clivia Gardent*.

FLORAL COMMITTEE, JANUARY 29, 1924.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and thirteen members present.

Awards Recommended :—*Gold Medal.*

To Messrs. Sutton, Reading, for forced bulbs.

Silver-gilt Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

Silver Banksian Medal.

To Messrs. Cuthbert, Southgate, for Hyacinths and Freesias.

To the Napsbury Mental Hospital, St. Albans, for Cyclamen and Primulas.

To Messrs. Peed, West Norwood, for *Iris tingitana* and Cyclamen.

To Messrs. S. Low, Bush Hill Park, for Carnation and other greenhouse plants.

Bronze Banksian Medal.

To Misses Allen-Brown, Henfield, for Carnation and Violets.

To Mr. C. Engelmann, Saffron Walden, for Carnations.

To Messrs. Hopman, Hillegom, Holland, for Hyacinths.

To Mr. G. W. Miller, Wisbech, for Primroses.

Silver-gilt Grenfell Medal.

To Miss G. Dorrien-Smith, for paintings.

Award of Merit.

To Carnation 'Freddie Ward' (votes unanimous), from Mr. G. Carpenter, West Hall Gardens, Byfleet. A large, well-formed, slightly fragrant, deep crimson, perpetual flowering variety, raised by the exhibitor as a seedling from 'Triumph.'

Other Exhibits.

Messrs. Barr, Taplow : Hyacinths and hardy plants.

Sir A. Mond, Romsey : Carnations.

Rev. B. Pinney, Durweston : Violets.

Messrs. R. Veitch, Exeter : *Iris stylosa* 'Imperatrice Elizabethae.'

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Section B.

Mr. G. W. E. LODER in the Chair, and twelve members present.

Awards Recommended :—*Silver Banksian Medal.*

To Mr. G. Reuthe, Keston, for hardy plants.

To Messrs. L. R. Russell, Richmond, for forced shrubs.

Bronze Banksian Medal.

To Messrs. Cheal, Crawley, for hardy plants.

To Messrs. Cutbush, Barnet, for rock garden.

To Messrs. Carter Page, London, for hardy plants.

To Messrs. Tucker, Oxford, for alpine.

To Messrs. Waterer, Sons & Crisp, Twyford, for hardy plants.

To Mr. F. G. Wood, Ashted, for hardy plants.

Award of Merit.

To *Gladiolus Melleri* (votes 9 for), from W. Van der Weyer, Esq., Corfe Castle. This interesting species comes from Kenya, where it grows in boggy ground on the upper slopes of Mt. Kenya. It bears small, hooded, flame-coloured flowers on a slender stem measuring from 2½ to 3 feet high.

To *Rhododendron scintillans* (votes 10 for), from Lady Aberconway and Hon H. D. McLaren, Bodnant. A charming, very early flowering, fragrant species

from China. It is of dwarf habit, and bears very pretty purplish-rose flowers about $\frac{3}{4}$ inch in width. This species is very hardy and will withstand very severe weather. The flowers which were exhibited on this occasion had withstood 12 degrees of frost followed by 3 inches of snow, a gale with 1 inch of rain and then 3 or 4 degrees of frost.

Other Exhibits.

Messrs. Baker, Codsall : hardy plants.
 Messrs. Gill, Falmouth : Rhododendrons, Arums, etc.
 Misses Hopkins, Shepperton : hardy plants.
 Miss G. Howse, Golders Green : miniature gardens.
 Mr. Klinkert, Richmond : clipped Box trees.
 Messrs. Skelton & Kirby, Pirbright : hardy plants.
 Mr. G. G. Whitelegg, Chislehurst : hardy plants.

FLORAL COMMITTEE, FEBRUARY 12, 1924.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and eighteen members present.

Awards Recommended :—

Gold Medal.

To Messrs. Sutton, Reading, for Cyclamen.

Silver-gilt Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
 To Baron Schröder, Engelfield Green, for Amaryllis.

Silver Banksian Medal.

To Messrs. Carter, Raynes Park, for Primulas, Hyacinths, etc.
 To Messrs. Cragg, Harrison & Cragg, Heston, for Cinerarias.
 To Hon. Vicary Gibbs, Elstree, for Cyclamen.
 To Messrs. S. Low, Bush Hill Park, for Carnations.
 To Mrs. O'Hea, London, for Cyclamen.

Bronze Banksian Medal.

To Misses Allen-Brown, Henfield, for Violets.
 To Messrs. Cuthbert, Southgate, for Hyacinths, etc.
 To Mr. C. Engelmann, Saffron Walden, for Carnations.
 To Miss Heathcote, Williton, for Violets.
 To Messrs. Luxford, Harlow, for Carnations.
 To Mr. G. W. Miller, Wisbech, for Primroses.

Other Exhibits.

Mrs. Gregory, Weston-super-Mare : *Viola odorata immaculata*.
 Major-General Sir Charles Hadden, Berkhamstead : Primula 'Rossway Beauty.'
 Mr. J. J. Kettle, Corfe Mullen : Violet 'Princess Mary.'
 Rev. B. Pinney, Durweston : Violet 'Tina Witaker.'

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Section B.

Mr. G. W. E. LODER in the Chair, and fourteen members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To M. Fenwick, Esq., Stow-on-the-Wold, for alpiners in pots.

Silver Banksian Medal.

To Messrs. Cheal, Crawley, for hardy plants and shrubs.
 To Mr. G. Reuthe, Keston, for shrubs and hardy plants.
 To Messrs. Waterer, Sons & Crisp, Twyford, for hardy plants.
 To Messrs. L. R. Russell, Richmond, for forced shrubs.

Bronze Banksian Medal.

- To Messrs. Barr, Taplow, for hardy plants.
 To Messrs. Cutbush, Barnet, for rock garden.
 To Messrs. Carter Page, London, for hardy plants.
 To Messrs. Tucker, Oxford, for hardy plants.

First-class Certificate.

To *Crocus Sieberi* 'Hubert Edelsten' (votes unanimous), from E. A. Bowles, Esq., Waltham Cross. This handsome *Crocus*, which was raised by Mr. H. M. Edelsten, has the interior lightly flushed and the exterior heavily suffused with bright bluish purple. It is slightly taller than the other *Crocuses* which received awards on this occasion.

Award of Merit.

To *Cotoneaster lactea* (votes unanimous), from F. C. Stern, Esq., Goring-on-Sea. A hardy evergreen shrub found by Mr. Geo. Forrest in thickets and scrub on the western flank of the Lichiang Range, China, at an altitude of 11,000 feet. Its chief recommendation is that its attractive small round bright-red berries remain on the plants throughout the winter. Birds do not appear to care for them.

To *Crocus chrysanthus* 'Bullfinch' (votes unanimous), from E. A. Bowles, Esq., Waltham Cross. A very pretty variety, with broad cream-rounded segments. It was raised by the exhibitor.

To *Crocus chrysanthus* 'Moonlight' (votes unanimous), from E. A. Bowles, Esq., Waltham Cross. A variety raised by Mr. John Hoog in Holland. It has large flowers of a soft yellow shade marked with brown on the back of each segment.

To *Eranthis Van Tubergenii* (votes unanimous), from Sir William Lawrence, Bt., Burford. This remarkably big Winter Aconite was raised by Messrs. Hoog at Haarlem. It is a sterile hybrid between *Eranthis hyemalis* and *E. cilicica*, and is larger and more vigorous than the parents. The flowers are bright yellow, sweet-scented and measure 2 inches across when fully expanded. The green involucre is more reflexed than in *E. hyemalis* and less finely divided than in *E. cilicica*. The plant is quite hardy.

To *Rhododendron mucronulatum* (votes unanimous), from the Royal Botanic Gardens, Kew. A beautiful early flowering species of vigorous habit from Korea, Japan, and Northern China. The leaves are about 3 inches long and 1½ inch broad. The flowers, which are about 1½ inch across, are of a rich purplish rose colour, and although flowering in January and February appear to suffer very little damage from frost.

Cultural Commendation.

To M. Fenwick, Esq., Stow-on-the-Wold, for fine pans of *Saxifraga Burseriana* 'Gloria,' *S. x Faldonside*, *S. x Irvingii*.

Other Exhibits.

- Messrs. Baker, Wolverhampton : hardy plants.
 Hon. Vicary Gibbs, Elstree : *Berberis Bealei*.
 Misses Hopkins, Shepperton : hardy plants.
 Mr. Klinkert, Richmond : clipped Box trees.
 The Orpington Nurseries, Orpington : conifers and shrubs.
 Messrs. Prichard, Christchurch : hardy plants.
 Messrs. Pulham, Bishops Stortford : rock garden.
 Messrs. Skelton & Kirby, Pirbright : hardy plants.
 L. Sutton, Esq., Reading : *Primula calciphila*.
 Mr. G. G. Whitelegg, Chislehurst : hardy plants.
 Mr. F. G. Wood, Ashted : rock garden.

FLORAL COMMITTEE, FEBRUARY 26, 1924.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and fourteen members present.

*Awards Recommended :—**Silver-gilt Banksian Medal.*

To Messrs. Allwood, Haywards Heath, for Carnations.

Silver Banksian Medal.

- To Mr. C. Engelmann, Saffron Walden, for Carnations.
- To Mr. E. J. Hicks, Twyford, for Roses.
- To Messrs. S. Low, Bush Hill Park, for Carnations and other greenhouse plants.
- To Mr. G. W. Miller, Wisbech, for Primroses and Polyanthus.

Bronze Banksian Medal.

- To Messrs. Cragg, Harrison & Cragg, Heston, for Cinerarias.
- To Messrs. Gill, Falmouth, for Arums, etc.
- To Mr. G. Prince, Oxford, for Roses.

Bronze Grenfell Medal.

- To Miss E. Kaye, for paintings.
- To Miss W. Walker, for paintings.

Award of Merit.

To Freesia 'Flame' (votes unanimous), from Rev. J. Jacob, Whitewell. A very sweet scented variety with deep golden yellow flowers having the lower segments blotched with vivid orange across which run lines of brown.

To Iris 'Little Boy Blue' (votes unanimous), from Messrs. H. Chapman, Rye. A very pretty variety of the *reticulata* type with clear deep-blue flowers having a yellow crest spotted with a few minute dots. The height of the flowers is about 6 inches. This Iris is particularly recommended for cultivation in pots.

To Lachenalia 'Rutland' (votes 10 for), from Rev. J. Jacob, Whitewell. A bright yellow variety with a deep edging of bronzy purple. The unopened buds are almost red in colour and add greatly to the beauty of the spike. The stems are spotted. In the matter of the deep edging this variety is considered to be a great advance on 'Rosemary,' which received an Award of Merit in 1916.

To Lachenalia 'Siam' (votes 9 for), from Rev. J. Jacob, Whitewell. A very free flowering deep golden yellow variety. The flowers are large and are borne in well-formed spikes.

Other Exhibits.

- Mr. G. Carpenter, Byfleet : Carnation 'Vivian Bowles.'
- Sir Alfred Mond, Bt., Romsey : Carnations.
- Rev. B. Pinney, Durweston : Violets.
- Messrs. Shearns, London : Cinerarias.
- Messrs. Sutton, Reading : Primulas.

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Section B.

Mr. G. W. E. LODER in the Chair, and fifteen members present.

Awards Recommended :—

Silver Banksian Medal.

- To Messrs. Barr, Taplow, for hardy plants.
- To Messrs. Cuthbert, Southgate, for Azaleas and Hyacinths.
- To Messrs. L. R. Russell, Richmond, for forced shrubs.
- To Messrs. Tucker, Oxford, for alpinas.
- To Messrs. Waterer, Sons & Crisp, Twyford, for hardy plants.

Bronze Banksian Medal.

- To Messrs. Cheal, Crawley, for hardy plants.
- To Messrs. Cutbush, Barnet, for rock garden.
- To Messrs. Carter Page, London, for alpinas and shrubs.
- To Messrs. Paul, Waltham Cross, for Camellias.
- To Mr. G. Reuthe, Keston, for hardy plants.
- To Messrs. Skelton & Kirby, Pirbright, for alpinas and shrubs.
- To Messrs. Wallace, Tunbridge Wells, for shrubs, etc.
- To Mr. F. G. Wood, Ashted, for hardy plants.

Award of Merit.

To *Canarina campanulata* (votes 6 for, 3 against), from Lieut.-Colonel Messel, Handcross. This handsome and uncommon, but by no means new, cool greenhouse plant comes from the Canary Islands. It bears singly drooping bells

having the inside of a bronze colour flushed with purple, while the outside is of a yellowish shade. The leaves are opposite, hastately sub-cordate, irregularly toothed. The plant is about 3 or 4 feet high.

Other Exhibits.

Messrs. Baker, Wolverhampton : shrubs and alpinas.
 Misses Hopkins, Shepperton : hardy plants.
 Mr. Klinkert, Richmond : clipped Box trees.
 Messrs. Maxwell & Beale, Broadstone : hardy plants.
 The Orpington Nurseries, Orpington : conifers and hardy shrubs.
 Messrs. Prichard, Christchurch : alpinas.

FLORAL COMMITTEE, MARCH 11, 1924.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and seventeen members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Mr. Forsyth, Putteridge, for Cyclamen.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
 To Messrs. Cuthbert, Southgate, for Azaleas and Hyacinths.
 To Mr. C. Engelmann, Saffron Walden, for Carnations.
 To Mr. E. J. Hicks, Twyford, for Roses.

Bronze Banksian Medal.

To Misses Allen-Brown, Henfield, for Violets.
 To Messrs. S. Low, Bush Hill Park, for Carnations.
 To Messrs. Luxford, Harlow, for Carnations.

Award of Merit.

To Cyclamen 'Giant White Wonder' (strain) (votes unanimous), from Mr. Forsyth, Putteridge. A very large flowered, pure white strain of Cyclamen.
 To *Viola odorata rosea* 'Rosine' (votes unanimous), from Mr. C. Duruz, Hythe. A very sweet scented Violet growing about 4 inches high and bearing pretty rose coloured flowers. The plant is of very compact habit.

Other Exhibits.

Mr. J. J. Kettle, Corfe Mullen : Violet 'Princess Mary.'
 Mr. Lansdell, Christchurch : Lachenalias.
 Sir Alfred Mond, Bt., Romsey : Carnation 'Norah Mond.'
 Rev. B. Pinney, Durweston : Violets.
 Mr. G. Reuthe, Keston : Iris 'Ruby.'

Section B.

Mr. G. W. E. LODER in the Chair, and fifteen members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Barr, Taplow, for shrubs and alpinas.

Silver Banksian Medal.

To Messrs. Carter Page, London, for hardy plants.
 To Messrs. L. R. Russell, Richmond, for forced shrubs.
 To Messrs. Tucker, Oxford, for alpinas.
 To Sir Arthur Vivian, St. Martin, Cornwall, for early flowering shrubs.
 To Messrs. Wallace, Tunbridge Wells, for hardy plants.

Bronze Banksian Medal.

- To Messrs. Cheal, Crawley, for rock garden.
- To Mr. Endtz, Boskoop, for Lilacs.
- To the Orpington Nurseries, Orpington, for shrubs and conifers.
- To Messrs. Peed, West Norwood, for forced shrubs.
- To Messrs. Prichard, Christchurch, for hardy plants.
- To Messrs. Waterer, Sons & Crisp, Twyford, for hardy plants.

Award of Merit.

To *Crocus aerius* 'Celeste' (votes unanimous), from Mr. G. Reuthe, Keston. A very pretty *Crocus* from Greece. It has large white segments tipped with pale lavender.

To *Crocus Tomasinianus pictus* (votes 8 for), from E. A. Bowles, Esq., Waltham Cross. A very pretty bright violet *Crocus* with segments of medium size.

To *Syringa* 'Jan van Tol' (votes 11 for), from Mr. F. G. Wood, Ashted. This handsome Lilac, named after its raiser, is of Dutch origin. It has very large single flowers borne in long handsome trusses, and is an excellent variety for forcing.

Other Exhibits.

- Messrs. Baker, Wolverhampton : shrubs and alpiners.
- Misses Hopkins, Shepperton : hardy plants.
- Mr. Klinkert, Richmond : clipped Box trees.
- Messrs. Maxwell & Beale, Broadstone : hardy plants.
- Messrs. Pulham, Bishops Stortford : hardy plants.
- Messrs. Skelton & Kirby, Pirbright : hardy plants.

FLORAL COMMITTEE, MARCH 25, 1924.

Section A.

Mr. J. F. McLEOD in the Chair, and thirteen members present.

Awards Recommended :—

Gold Medal.

- To Mr. C. Engelmann, Saffron Walden, for Carnations.

Silver-gilt Banksian Medal.

- To Messrs. Allwood, Haywards Heath, for Carnations.
- To Messrs. Carter, Raynes Park, for Hyacinths.

Silver Banksian Medal.

- To Mr. E. J. Hicks, Hurst, for Roses.
- To Messrs. S. Low, Enfield, for Carnations and greenhouse plants.
- To Messrs. Luxford, Harlow, for Carnations.
- To Mr. G. W. Miller, Wisbech, for Polyanthus, etc.
- To Mr. G. Prince, Oxford, for Roses.

Bronze Banksian Medal.

- To Mr. J. J. Kettle, Corfe Mullen, for Violets.
- To Mr. B. Pinney, Durweston, for Violets.

Award of Merit.

To *Crocus* 'Queen of the Blues' (votes 7 for), from the Director, R.H.S. Gardens, Wisley. A large handsome variety, with broad violet-blue segments and bright orange anthers. The colour is much darker at the base of the segments. This *Crocus* was sent to Wisley in 1922 by Mr. W. F. van Waveren, Hillegom, Holland, and it is very effective when growing in a mass.

Other Exhibits.

- Lady Aberconway and the Hon. H. D. McLaren, Bodnant : Clivias.
- Misses Allen-Brown, Henfield : Violets.
- Messrs. Baker, Codsall : Primula 'Bunty.'
- Mr. H. Bazeley, Eastleigh : Violet 'Doris Bazeley.'
- Mr. J. H. Pemberton, Romford : Roses.
- Mr. C. G. van Tubergen, Haarlem : Freesia 'Apothéosis.'

Section B.

Mr. G. W. E. LODER in the Chair, and fifteen members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Mr. G. Reuthe, Keston, for shrubs and hardy plants.
To Messrs. Russell, Richmond, for flowering shrubs.

Silver Banksian Medal.

To Messrs. Cutbush, Barnet, for rock garden.
To Messrs. Gill, Falmouth, for Anemones and Primroses.
To Messrs. Rogers, Southampton, for hardy plants.
To Mr. G. G. Whitelegg, Chislehurst, for hardy plants.

Bronze Banksian Medal.

To Messrs. Barr, Taplow, for hardy plants.
To Messrs. Carter Page, London, for hardy plants.
To Messrs. Peed, West Norwood, for flowering shrubs.
To Messrs. Prichard, Christchurch, for hardy plants.
To Messrs. Pulham, Bishops Stortford, for shrubs and hardy plants.
To Messrs. Tucker, Oxford, for hardy plants.
To Messrs. Waterer, Sons & Crisp, Twyford, for hardy plants.

Award of Merit.

To *Iris unguicularis* 'Peacock' (votes unanimous), from W. R. Dykes, Esq., M.A., Merton. This very pretty variety was one of a batch of seedlings raised from a cross between a dwarf form of *Iris unguicularis* from Cephalonia and a taller form with larger leaves from Crete. The soft violet falls are prettily marked with a feathered zone of gold, yellow and white, while there are occasional tinges of rosy violet and splashes of a darker shade. This hybrid flowers later than the Algerian form.

To *Saxifraga* 'Lady Beatrix Stanley' (votes 8 for, 1 against), from Messrs. Prichard, Christchurch. A variety raised as the result of a cross between *S. lilacina* and *S. Goldroneana* (*media* × *aretoides*). In habit it resembles the former parent. From a cushion of tiny foliage arise comparatively large bright rosy-purple flowers, on very short stalks.

Cultural Commendation.

To the Curator, Chelsea Physic Gardens, for *Cephalotus follicularis*.

Other Exhibits.

Messrs. Baker, Wolverhampton : hardy plants.
A. C. Bartholomew, Esq., Reading : *Cyclamen persicum odoratum*.
Sir Mark Collet, Bt., Kemsing : *Iris alata* hybrid.
T. C. Corbet, Esq., Guernsey : 'Jack-in-the-Green' Primroses.
Misses Hopkins, Shepperton : hardy plants.
Mr. Klinkert, Richmond : clipped Box trees.
Messrs. Maxwell & Beale, Broadstone : hardy plants.
Maytham Gardens, Rolvenden : *Viburnum fragrans*, etc.
Messrs. Skelton & Kirby, Pirbright : hardy plants.
Mr. F. G. Wood, Ashted : hardy plants.

FLORAL COMMITTEE, APRIL 8, 1924.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and sixteen members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Sutton, Reading, for Freesias.

Silver Banksian Medal.

- To Messrs. Carter, Raynes Park, for Cinerarias and Tulips.
- To Mr. J. Douglas, Great Bookham, for Auriculas.
- To Mr. C. Engelmann, Saffron Walden, for Carnations.

Bronze Banksian Medal.

- To Mr. J. J. Kettle, Corfe Mullen, for Violets.
- To Mr. J. H. Pemberton, Havering-atte-Bower, for Roses.
- To Messrs. S. Low, Enfield, for Carnations.

Award of Merit.

To Carnation 'Eldora' (votes 12 for), from Messrs. Allwood, Haywards Heath. A very pretty perpetual flowering fancy variety of good form and free flowering habit. The ground colour is white delicately pencilled with bright rose-pink.

To Violet 'Princess Mary' (votes unanimous), from Mr. J. J. Kettle, Corfe Mullen. A large sweetly scented variety, similar in colour to 'Princess of Wales' but with a very distinct deep violet double rosette centre which has occasional tinges of mauve.

Other Exhibits.

- Messrs. Baker, Wolverhampton : *Primula* 'Pam.'
- Mrs. Garnet Botfield, Albrighton : *Primula* 'Beamish.'
- Messrs. Dickson, Belfast : Anemones.
- Mr. J. D. Hay, Bury St. Edmunds : *Richardia aethiopica*, 'Beyton Purity.'
- Lady Herbert, Abergavenny : Carnations.
- Messrs. Jarman, Chard : Pelargoniums and Violas.
- Mrs. MacColl, Harrogate : Polyanthus 'Barrowby Gem.'
- Mr. B. Pinney, Durweston : Violets.
- Messrs. Reamsbottom, West Drayton : Anemones.
- Lady Beatrix Stanley, Market Harborough : Primrose 'Ethel.'

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Section B.

Mr. G. W. E. LODER in the Chair, and sixteen members present.

Awards Recommended :—

Silver Banksian Medal.

- To Messrs. Cutbush, Barnet, for rock garden.
- To Messrs. Carter Page, London, for hardy plants.
- To Messrs. Prichard, Christchurch, for hardy plants.
- To Mr. G. Reuthe, Keston, for hardy plants and Rhododendrons.
- To Messrs. Russell, Richmond, for forced shrubs, etc.
- To Messrs. Tucker, Oxford, for alpinas.

Bronze Banksian Medal.

- To Messrs. Cheal, Crawley, for hardy plants and Dahlias.
- To Messrs. C. Elliott, Stevenage, for alpinas.
- To Messrs. S. Low, Enfield, for forced shrubs, etc.
- To T. H. Lowinsky, Esq., Sunninghill, for Rhododendrons.
- To Mr. G. W. Miller, Wisbech, for hardy plants.
- To Messrs. Rogers, Southampton, for hardy plants.
- To Messrs. Waterer, Sons & Crisp, Twyford, for hardy plants.
- To Mr. F. G. Wood, Ashted, for hardy plants.

Award of Merit.

To *Arcteria nana* (votes 11 for), from Mr. G. Reuthe, Keston. A very dwarf hardy alpine Ericaceous shrub from Spitzbergen. Its very small white flowers are sweetly scented. Its tiny grooved oval leaves are scarcely more than $\frac{1}{4}$ inch long. The exhibitor says that the plant is very hardy and easy to grow.

To *Prostanthera rotundifolia* (votes unanimous), from the Director, Royal Botanic Gardens, Kew. A temperate house shrub, growing about 3 feet high. It bears enormous numbers of small violet-purple labiate flowers in axillary racemes. The small leaves are broadly ovate-orbicular or spatulate. The plant is a native of Australia.

To *Rhododendron* × *prostigiatum* (votes 12 for, 2 against), from E. J. P. Magor, Esq., St. Tudy. This interesting plant was raised by the exhibitor as the result of a cross between *R. prostratum* and *R. fastigiatum*, and its name was suggested by the late Sir I. Bayley Balfour. The plant is about 6 inches high and bears deep purple flowers about 1 inch across. Its small leaves are dark green above and lighter below.

Cultural Commendation.

To T. H. Lowinsky, Esq., Sunninghill, for *Rhododendron bullatum* and *R. calostrotum*.

Other Exhibits.

Lady Aberconway and the Hon. H. D. McLaren, Bodnant: *Rhododendron Oldhamii*.

Messrs. Baker, Wolverhampton: hardy plants.

Sir Mark Collet, Bt., Kemsing: *Iris alata* hybrid.

Mrs. R. J. Hanbury, Poolewe: *Rhododendrons*, etc.

Misses Hopkins, Shepperton: hardy plants.

Mr. Klinkert, Richmond: clipped Box trees.

Messrs. Ladhams, Southampton: hardy plants.

Messrs. Maxwell & Beale, Broadstone: hardy plants.

Messrs. Pulham, Bishops Stortford: hardy plants.

Messrs. Skelton & Kirby, Pirbright: hardy plants.

W. Van der Weyer, Esq., Corfe Castle: *Haemanthus filiflorus* and *Craterostigma* sp.

Mr. G. G. Whitelegg, Chislehurst: hardy plants and shrubs.

Miss E. Willmott, V.M.H., Great Warley: *Armeria caespitosa*.

FLORAL COMMITTEE, APRIL 29, 1924.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and seventeen members present.

Awards Recommended:—

Silver Banksian Medal.

To Mr. J. Douglas, Great Bookham, for Auriculas.

To Mr. C. Engelmann, Saffron Walden, for Carnations.

To Mr. E. J. Hicks, Hurst, for Roses.

To Messrs. S. Low, Bush Hill Park, for Carnations and other greenhouse plants.

To Mr. G. W. Miller, Wisbech, for Polyanthus.

To Mr. G. Prince, Longworth, for Roses.

Bronze Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. B. R. Cant, Colchester, for Roses.

To Messrs. F. Cant, Colchester, for Roses.

To Messrs. John & A. H. Crook, Beaconsfield, for Polyanthus.

To Messrs. Godfrey, Exmouth, for Schizanthus.

To Messrs. Jarman, Chard, for Pelargoniums and Violas.

To Messrs. Carter Page, London, for Violas.

To Mr. J. H. Pemberton, Havering-atte-Bower, for Roses.

To Messrs. Reamsbottom, West Drayton, for Anemones.

Award of Merit.

To H.T. Rose 'Clovelly' (votes unanimous), from Mr. E. J. Hicks, Hurst. A large pale pink seedling of fine form. It is a strong grower and is said to be useful for bedding, market work, and cultivation under glass.

Other Exhibits.

Messrs. Cheal, Crawley: Dahlias.

G. E. Wilson, Esq., Kidderminster: Geranium for opinion.

Section B.

Mr. G. W. E. LODER in the Chair, and seventeen members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Hon. Vicary Gibbs, Elstree, for alpiners in pans.
To T. H. Lowinsky, Esq., Sunninghill, for Rhododendrons.
To Messrs. Wallace, Tunbridge Wells, for flowering shrubs.

Silver Banksian Medal.

To Messrs. Cheal, Crawley, for hardy plants and shrubs.
To Mr. R. C. Notcutt, Woodbridge, for shrubs.
To Sir John Ramsden, Bt., Gerrards Cross, for Rhododendrons.
To Mr. G. Reuthe, Keston, for hardy plants and shrubs.
To Lionel de Rothschild, Esq., Exbury, for Rhododendrons.
To Messrs. Tucker, Oxford, for hardy plants.
To Messrs. Waterer, Sons & Crisp, Twyford, for Rhododendrons.
To Mr. F. G. Wood, Ashted, for hardy plants.

Bronze Banksian Medal.

To Messrs. Cuthbert, Southgate, for flowering shrubs.
To Messrs. Ladhams, Southampton, for hardy plants.
To Messrs. Maxwell & Beale, Broadstone, for hardy plants.
To the Maytham Gardens, Rolvenden, for *Veronica Hulkeana* and Dutch Irises.
To Messrs. Pulham, Bishops Stortford, for hardy plants.
To Messrs. Rogers, Southampton, for hardy plants.
To Messrs. Waterer, Sons & Crisp, Twyford, for hardy plants.

Award of Merit.

To *Aubrietia* 'Gloriosa' (votes 10 for), from Messrs. M. Prichard, Christchurch. A seedling raised by the exhibitors in 1921. It has large flowers measuring over an inch across. They are rosy mauve in colour with a small white eye.

To *Hibbertia volubilis* (votes 11 for, 2 against), from Sir Wm. Lawrence, Bt., Dorking. A very tender Australian climbing plant, requiring greenhouse cultivation. The deep yellow sessile flowers are borne singly and measure about 2½ inches across. They have five spreading petals and a central bunch of golden stamens. The leaves are obovate-lanceolate in shape.

To *Prunus serrulata* 'Kojina' (votes unanimous), from C. Ingram, Esq., Benenden. The characteristics of this pretty Japanese Cherry are the large size and somewhat campanulate form of its pure white flowers, which have greatly elongated peduncles and are borne in graceful long-stemmed corymbs. There is also very frequently an inner ring of small petaloid stamens. It is a quick growing and vigorous tree.

To *Rhododendron* × *brachydum* *primum* (votes 10 for, 3 against), from J. C. Williams, Esq., St. Austell. This interesting hybrid resulted from a cross between Wilson's *R. brachyanthum*, No. 6771, and the same collector's *R. flavidum*, No. 1773. The hybrid has pale yellow tubular flowers about one inch long borne with great freedom. The small elliptical leaves are dark green and measure an inch in length.

To *Rhododendron* 'Souvenir de Dr. S. Endtz' (votes 10 for), from Messrs. L. J. Endtz, Boskoop, Holland. This variety resulted from a cross between R. 'Pink Pearl' and R. 'John Walter.' Its large bright rose-pink flowers, with the upper segments dotted with dark crimson, are borne in a large and handsome truss.

To *Schizocodon macrophylla* (votes 9 for), from Mr. G. Reuthe, Keston. This uncommon Japanese plant has small deep pink tubular flowers, with a beautifully fringed corolla. Its foliage is bronze tinted.

To *Silene acaulis* 'Elliott's variety' (votes 8 for, 1 against), from Hon. Vicary Gibbs, Elstree. This clear pink, free-flowering variety was collected by Mr. Clarence Elliott at Mt. Cenis, Italy. Its flowers rise about one inch above a dense cushion of small, neat foliage.

To *Viola* 'Black Knight' (votes 6 for, 3 against), from Mr. T. Carlile, Twyford. A large almost black variety of the *gracilis* type.

Cultural Commendation.

To the Marquis of Headfort, Kells, for *Rhododendron* seedlings.
To F. Lloyd, Esq., Croydon, for *Saxifraga Petraschii*.

Other Exhibits.

Messrs. Baker, Codsall : hardy plants.
Col. Stephenson Clarke, C.B., Cuckfield : *Rhododendron* Farrer 209 and *Saxifraga* sp.
Mr. G. H. Dalrymple, Bartley : *Primula pulverulenta* 'Bartley Strain.'
Mr. G. R. Downer, Chichester : hardy plants.
Messrs. Gill, Falmouth : *Rhododendron burmanicum*.
N. G. Hadden, Esq., West Porlock : choice shrubs.
Misses Hopkins, Shepperton : hardy plants.
G. W. E. Loder, Esq., Ardingley : *Rhododendrons*.
E. J. P. Magor, Esq., St. Tudy : *Rhododendron* \times *neriifolium*.
Messrs. Carter Page, London : hardy plants.
Messrs. Skelton & Kirby, Pirbright : hardy plants.
Messrs. Watson, Dublin : *Cytisus* 'Tombe's variety.'
Mr. Watson, Warley : *Ficaria gigantea*.
Mr. G. G. Whitelegg, Chislehurst : *Primula marginata* 'Linda Pope.'
Miss E. Willmott, V.M.H., Warley : *Armeria caespitosa* 'Warley variety.'

FLORAL COMMITTEE, MAY 13, 1924.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and sixteen members present.

Awards Recommended :—*Gold Medal and Special Congratulations.*

To Sir George Holford, Tetbury, for *Hippeastrums*.

Silver-gilt Banksian Medal.

To Hon. Vicary Gibbs, Elstree, for group of *Gardenia florida*.
To E. H. Watson, Esq., Mill Hill, for *Calceolarias*, etc.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. B. R. Cant, Colchester, for Roses.
To Mr. J. Douglas, Great Bookham, for Auriculas.
To Napsbury Mental Hospital, St. Albans, for flowering and foliage plants.

Bronze Banksian Medal.

To Messrs. F. Cant, Colchester, for Roses.
To Mr. C. Engelmann, Saffron Walden, for Carnations.
To Messrs. S. Low, Enfield, for Carnations and other greenhouse plants.
To Mr. G. W. Miller, Wisbech, for hardy plants.
To Messrs. Carter Page, London, for Violas.
To Mr. J. H. Pemberton, Havering-atte-Bower, for Roses.
To Messrs. Silvester, London, for Roses.
To Mr. Yandell, Maidenhead, for Violas.

Other Exhibits.

Messrs. J. & A. H. Crook, Beaconsfield : *Polyanthus* 'Jordan's Strain.'
Mrs. Fremantle, Penn : *Polyanthus* 'Flame Queen.'
Messrs. Reamsbottom, West Drayton : Anemones.
Messrs. Skelton & Kirby, Pirbright : *Viola gracilis lutea*.
Mrs. Tenison, Westerham : *Polyanthus*.
Messrs. Watkins & Simpson, London : *Schizanthus* 'Pink Pearl.'

Section B.

Mr. G. W. E. LODER in the Chair, and fifteen members present.

Awards Recommended :—

Silver Banksian Medal.

- To Messrs. Bunyard, Maidstone, for Irises.
- To Messrs. Cheal, Crawley, for flowering shrubs, etc.
- To Messrs. Cuthbert, Southgate, for Azaleas.
- To Mr. R. C. Notcutt, Woodbridge, for flowering shrubs.
- To Messrs. Prichard, Christchurch, for hardy plants.
- To Mr. G. Reuthe, Keston, for hardy plants and Rhododendrons.
- To Messrs. Russell, Richmond, for Rhododendrons, etc.
- To Mr. G. G. Whitelegg, Chislehurst, for flowering shrubs.

Bronze Banksian Medal.

- To Messrs. Baker, Wolverhampton, for hardy plants.
- To Messrs. C. Elliott, Stevenage, for hardy plants.
- To Messrs. Maxwell & Beale, Broadstone, for hardy plants.
- To Messrs. Carter Page, London, for hardy plants.
- To Messrs. Prichard, Westmoors, for hardy plants.
- To Messrs. Skelton & Kirby, Pirbright, for hardy plants.
- To Messrs. Tucker, Oxford, for hardy plants.
- To Mr. C. Turner, Slough, for flowering shrubs.
- To Messrs. Waterer, Sons & Crisp, Twyford, for Rhododendrons.
- To Messrs. Waterer, Sons & Crisp, Twyford, for hardy plants.
- To Mr. F. G. Wood, Ashted, for hardy plants.

First-class Certificate.

To *Daphne rupestris grandiflora* (votes 8 for), from Messrs. Tucker, Oxford. This beautiful rock-garden shrub received an Award of Merit on April 23, 1918. It bears an abundance of sweetly scented, deep rose-pink flowers of considerably larger size than those found in the type.

To *Iris 'Turkoman'* (votes unanimous), from W. R. Dykes, Esq., M.A., Merton. This variety received an Award of Merit on May 20, 1919. It is the result of a cross between *I. stolonifera* and *I. Korolkowi*. The erect standards are of a coppery-bronze shade with a central streak of violet, while the falls are of a rich purplish-brown colour with a blue beard.

Award of Merit.

To *Cerasus serrulata* 'Ojochin' (votes 9 for, 1 against), from Mr. R. C. Notcutt, Woodbridge. A very free flowering Cherry from Japan. It has large white flowers flushed with blush-pink on the outside.

To *Geum reptans* 'Keston type' (votes unanimous), from Mr. G. Reuthe, Keston. This form, which comes from the Austrian Tyrol, has larger flowers than the type. They are of a deep yellow colour, with a big bunch of golden stamens. The plant is about 6 inches high and has reddish stems.

To *Primula pulverulenta* 'Lady Thursby' (votes unanimous), from Mr. G. H. Dalrymple, Bartley, near Southampton. A very fine pale salmon-pink variety with a yellow eye. The important point about it is that it is very fertile and will come 90 per cent. true from seed. It is the result of 10 years' work, undertaken with the object of obtaining a fertile form of *Primula pulverulenta* similar to the sterile sport 'Mrs. R. V. Berkeley.'

To *Pyrus* (Malus) × 'Wisley Crab' (votes unanimous), from the R.H.S. Gardens, Wisley. This handsome tree is a seedling from *Pyrus Niedzwetzkyana* and has large, single, purplish-rose flowers measuring nearly 2 inches across. It is very free flowering and its young foliage is bronze tinted.

Cultural Commendation.

To Messrs. Clarence Elliott, Stevenage, for *Androsace arachnoidea superba* and *Daphne rupestris*.

To Lady Raleigh, Chelmsford, for *Echiums*.

To Messrs. L. R. Russell, Richmond, for *Rhododendron rosaeiflorum*.

Other Exhibits.

Misses Hopkins, Shepperton : hardy plants.

C. Ingram, Esq., Beenden : *Prunus serrulata* 'Senriko.'

Messrs. Jones & Ingwersen, Letchworth : alpinas.

FLORAL COMMITTEE, MAY 27, 1924.

Section A.

AT CHELSEA.

Mr. H. B. MAY, V.M.H., in the Chair, and fifteen members present.

Awards Recommended:—

Award of Merit.

To Carnation 'Carola striata' (votes 13 for), from Mr. C. Engelmann, Saffron Walden. A sport from the well-known variety 'Carola.' The flowers are well formed and of a dark-red colour, flaked with a deeper shade.

To Carnation 'Sir Philip Sassoon' (votes 13 for), from Messrs. S. Low, Bush Hill Park. A large dark-crimson perpetual flowering variety of excellent form.

To Pink 'Fire King' (votes unanimous), from Mr. C. H. Herbert, Birmingham. The salmon-scarlet flowers of this variety are large and of a nice form. The plant is said to be a free grower and of bushy habit.

To Pink 'Mrs. Giffard Woolley' (votes 11 for, 2 against), from Mr. C. H. Herbert, Birmingham. A very large and fragrant salmon-pink variety with slightly darker markings at the base.

Other Exhibits.

Messrs. Allwood, Haywards Heath: *Dianthus Allwoodii* 'Beatrice' and 'Elizabeth.'

J. S. Arkwright, Esq., Presteign: Lily of the Valley 'Kinsham Pink.'

Messrs. Bastin, Bexley Heath: Begonia 'Mrs. R. Lane.'

Mr. W. Batchelor, Towcester: *Primula obconica* 'Queen Alexandra.'

Messrs. Bees, Chester: *Viola gracilis* 'Moonlight.'

Mr. F. J. Bell, Whitley Bay: Violas.

Mr. T. Carlile, Twyford: Viola 'Lady Crisp.'

W. M. Christy, Esq., Emsworth: Aquilegias 'Watergate' seedlings A and B.

Mr. W. A. Collier, Redbourn: *Erigeron* 'Diana.'

Mr. G. R. Downer, Chichester: Lupines.

Mr. J. Douglas, Great Bookham: Border Carnation 'Douglasdale.'

W. R. Dykes, Esq., M.A., Merton: Irises 'Moonlight' and 'Templar.'

Mr. J. E. Fitt, Norwich: *Dianthus* 'Indian Queen.'

Major-Gen. Sir C. F. Hadden, Berkhamstead: *Pelargonium* 'Pride of Rossway.'

Messrs. Kelway, Langport: *Pyrethrum* 'Lady Astor.'

Maytham Gardens, Rolvenden: *Gladioli*.

Mr. J. W. Wilkinson, Willington: *Pyrethrum* 'Princess Mary.'

The following awards, recommended by the sub-committee to *Schizanthus* and Wallflowers on trial at Wisley, were confirmed:—

SCHIZANTHUS.

Award of Merit.

6. 'Snowflake' (*Wisetonensis*), sent by Messrs. Watkins & Simpson, London.
51. *Wisetonensis* 'Excelsior', sent by Messrs. Watkins & Simpson, London.
54. *Wisetonensis* 'Giant Prize' strain, sent by Messrs. Barr & Sons, London.
25. *Wisetonensis*, 'Pylewell' strain, sent by Messrs. W. F. Hamilton, Lymington.
64. 'Giant Flowered' (*Wisetonensis*), sent by Messrs. Clibrans, Altrincham.
66. Chislehurst Giant Hybrids, sent by Messrs. Barr & Sons, London.
68. Tall Giant-flowered Hybrids, sent by Messrs. W. H. Simpson, Birmingham.

Highly Commended.

14. *Wisetonensis* 'Pink Pearl', sent by Messrs. Barr & Sons, London.
60. 'Superb' (*Wisetonensis*), sent by Messrs. Godfrey & Son, Exmouth.
2. *Pinnatus* White, sent by Messrs. Toogood & Sons, Southampton.
37. 'Butterfly' (*Wisetonensis*), sent by Messrs. J. Carter, Raynes Park.
39. New Dwarf Hybrids (*Wisetonensis*), sent by Messrs. A. Dawkins, Chelsea.
43. 'Dr. Badger Improved', sent by Messrs. Dobbie & Co., Edinburgh.
47. Hybrids, sent by Messrs. F. C. Heinemann, Erfurt, Germany.
3. *Pinnatus* 'White Beauty', sent by Messrs. Barr & Sons, London.
49. *Papilionaceus*, sent by Messrs. Barr & Sons, London.
69. Large-flowered Hybrids, sent by Messrs. J. C. Wheeler & Son, Gloucester.

WALLFLOWERS.

Highly Commended.

- 1.) 'White Gem,' sent by Messrs. Dobbie, Edinburgh.
- 2.) Alike. { 'Linnaeus,' sent by Messrs. Barr, London.
- 5.) { 'Ivory White,' sent by Messrs. Barr, London.
- 3, 4. 'White Dame,' sent by Messrs. R. Veitch, Exeter; Messrs. Barr, London.
- 12, 13. 'Primrose Dame,' sent by Messrs. R. Dicks, Manchester; Messrs. T. Cullen, Witham.
24. 'Extra Dwarf Golden,' sent by Messrs. Barr, London.
31. 'Golden Monarch,' sent by Messrs. Watkins & Simpson, London.
47. 'Tall Golden,' sent by Messrs. J. Carter, Raynes Park.
48. 'Golden Queen,' sent by Messrs. T. Cullen, Witham.
51. 'Golden Bedder,' sent by Messrs. Barr, London.
- 72, 73. 'Harbinger,' sent by Messrs. Barr, London; Messrs. F. Dicks, Manchester.
85. 'Dresden,' sent by Messrs. Barr, London.
- 111, 112. 'Vulcan,' sent by Messrs. Watkins & Simpson, London; Messrs. J. Fitzpatrick, Ashton-under-Lyne.
123. Blood Red selected, sent by Messrs. J. Carter.
126. Blood Red, sent by Messrs. F. Dicks, Manchester.
- 139, 162. 'Goliath,' sent by Messrs. Barr, London; Messrs. F. C. Heinemann, Erfurt.
160. Sent as 'Royal Purple,' but like 'Goliath,' by Messrs. M. M. I. Rivoire, Lyon.
164. 'Ellen Willmott,' sent by Messrs. Watkins & Simpson, London.
152. 'Cheiranthus Allionii,' sent by Messrs. R. Veitch, Exeter.

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Section B.

AT CHELSEA.

Mr. W. J. BEAN, V.M.H., in the Chair, and eleven members present.

Awards Recommended:—*First-class Certificate.*

To *Meconopsis pseudo-integrifolia* (votes unanimous), from Mr. A. K. Bulley, Neston. A beautiful biennial collected by Mr. G. Forrest. It grows about 18 inches high, and has a branching inflorescence carrying many large clear yellow flowers.

To *Rhododendron Griersonianum* (votes 9 for), from T. H. Lowinsky, Esq., Sunninghill, and Lionel de Rothschild, Esq., Exbury. This beautiful species makes a shrub from 5 to 7 feet high, and was discovered by Mr. G. Forrest in Yunnan in 1917. The plant exhibited bore a fine truss of ten wide-open, fiery salmon flowers, with very striking red filaments. The dark-green, narrow, elliptical leaves are covered with tomentum on the under sides.

Award of Merit.

To *Arisaema candidissimum* (votes 8 for), from Mr. A. K. Bulley, Neston. This interesting hardy plant was collected by Mr. G. Forrest. The spathe is pea-green at the base and milky-white towards the top. The spadix is green, and the leaf consists of three large leaflets supported on a comparatively long, stout stem.

To *Dianthus musculae* (votes 8 for), from Mr. A. K. Bulley, Neston. This plant was collected by Mr. Sunderman. It forms a dwarf cushion of narrow linear foliage crowded with pale rose-pink flowers about $\frac{1}{2}$ inch across, borne on stems about 1 inch high.

To *Geranium* 'Farrer's Pink' (votes 10 for), from C. T. Musgrave, Esq., Godalming. This hardy plant grows about 6 inches high, and has small, neat, deeply cut foliage. It bears an abundance of pale-pink single flowers with prominent dark-brown anthers. It is known in the horticultural trade as *G. Farreri* and is closely allied to, and probably identical with, *G. napuligerum*.

To *Iris* 'Carmelo' (votes 5 for, 2 against), from W. R. Dykes, Esq., M.A., Merton. This *Iris* was raised by Mr. Mohr, of America. It is the result of a cross between *I. Korolkowi* and *I. germanica*. The standards are violet-blue and the falls slightly paler, veined with a darker shade which also forms a central streak. The beard is dull gold, shaded blue.

To *Linum narbonense* 'Tilgate Blue' (votes 6 for), from Mr. H. Hemsley, Crawley. A very dark blue variety of this graceful species.

To *Meconopsis primulina* (votes unanimous), from Mr. A. K. Bulley, Neston. This very striking species was collected by Mr. Ward. The plant exhibited was about 1 foot high, and carried a large violet-purple flower with a mass of dark stamens.

To *Pieris Forrestii* (votes 9 for), from Mr. A. K. Bulley, Neston. This hardy shrub was collected by Mr. Forrest. It has large greenish-white, bell-shaped flowers, and the young foliage is of a very striking salmon-pink colour.

To *Syringa* 'Maréchal Lannes' (votes 6 for), from Mr. R. C. Notcutt, Woodbridge. This variety bears large dense panicles of rosy-mauve flowers.

To *Syringa* 'Pasteur' (votes 9 for), from Mr. R. C. Notcutt, Woodbridge. A large-flowered, dark rosy-purple variety, sometimes showing a tendency to doubling.

Other Exhibits.

Messrs. Hayes, Ambleside: *Polystichum Longchites cristatum*.

Messrs. Maxwell & Beale, Broadstone: Saxifraga 'Esther.'

Mr. A. Perry, Enfield: Irises.

L. Richardson, Esq., Waterford: Cytisus 'Laura E. Richardson.'

A. G. Soames, Esq., Uckfield: Rhododendron 'Pink Fairy.'

F. C. Stern, Esq., London: *Cytisus monspessulanus* and *Stellera Chamaejasme*, A.M., May 1923.

Messrs. Waterer, Sons & Crisp, Bagshot: Rhododendron 'Mother of Pearl.'

Messrs. Watson, Killiney: Cytisus 'Killiney' and C. 'Dorothy Walpole.'

E. L. Winter, Esq., Bude: *Primula pulchella*.

FLORAL COMMITTEE, JUNE 11, 1924.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and thirteen members present.

Awards Recommended:—

Gold Medal.

To Messrs. Bunyard, Maidstone, for Irises.

Silver-gilt Banksian Medal.

To Messrs. Barr, Taplow, for Irises.

To Messrs. R. Bolton, Halstead, for Sweet Peas.

To Mr. H. J. Jones, Lewisham, for Hydrangeas.

To the Orpington Nurseries, Orpington, for Irises.

To Mr. A. Perry, Enfield, for Irises.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Bath, Wisbech, for Irises, Gladioli, Pyrethrums, etc.

To Messrs. Blackmore & Langdon, Bath, for Delphiniums, etc.

To Mr. G. R. Downer, Chichester, for Lupines.

To Messrs. Ireland & Hitchcock, Marks Tey, for 'Mascotts' Dianthus.

To Messrs. S. Low, Bush Hill Park, for Carnations, Roses, etc.

To Mr. H. Marcham, Borough Green, for new hybrid Lupines.

To Mr. G. Prince, Oxford, for Roses.

To Messrs. Sutton, Reading, for Aquilegias.

To Messrs. Wallace, Tunbridge Wells, for Irises.

To Messrs. Waterer, Sons & Crisp, Twyford, for Irises.

To Mr. W. Wells, jun., Merstham, for hardy flowers.

To Mr. G. G. Whitelegg, Chislehurst, for Irises.

Bronze Banksian Medal.

To Mr. C. Engelmann, Saffron Walden, for Carnations.

To Messrs. Harkness, Bedale, for Lupines.

To Messrs. Kelway, Langport, for Pæonies and Pyrethrums, etc.

To Messrs. Lowe & Gibson, Crawley Down, for Irises.

To Mr. J. H. Pemberton, Havering-atte-Bower, for Roses.

To Mrs. Sommers, Alton, for Carnations.

To E. H. Watson, Esq., Mill Hill, for *Kalanchoe flammula*, etc.

Award of Merit.

To Heuchera 'Argus' (votes 7 for, 1 against), from Messrs. M. Prichard, Christchurch. A large-flowered carmine variety raised by Messrs. Lemoine et Fils of Nancy.

To Hydrangea 'Elmar' (votes unanimous), from Mr. H. J. Jones, Lewisham. This variety bears numerous large trusses of bright rose-pink flowers with a small white centre.

To Iris 'Amber' (votes 8 for), from W. R. Dykes, Esq., M.A., Merton. A large free-flowering deep yellow variety with a golden-orange beard. Its colour is deeper and better than that of the American Iris 'Shekinah,' which it otherwise resembles.

To Iris 'Souvenir de Madame Gaudichau' (votes 6 for), from Messrs. Wallace, Tunbridge Wells. A very large and handsome bearded Iris of French origin. It has broad deep purple falls with a golden beard and deep violet standards. It is a tall and rigid variety and is said to withstand bad weather remarkably well.

To Pyrethrum 'Mrs. James Leake' (votes 7 for, 1 against), from Mr. J. Leake, Chilwell. A large deep rose-pink single variety.

To Pyrethrum 'Princess Mary' (votes unanimous), from Mr. J. W. Wilkinson, Willington. A bright rose-pink sport from Pyrethrum 'Queen Mary.' Its flowers are large and very double and are supported on strong, stiff stems.

To *Trollius Ledebouri* 'Golden Queen' (votes unanimous), from Messrs. Ladhams, Southampton. This variety is fuller, deeper in colour and more rounded in the flower than the type. Its large flowers, in which the sepals constitute the most conspicuous part, are deep orange. The plant is also said to be dwarfer and more compact than the type.

Other Exhibits.

G. P. Baker, Esq., Bexley : Irises.

Mr. H. Barnard, Poynings : Pelargonium 'Barnard Castle.'

J. C. Beck, Esq., Henley : Carnation 'Bébé' and Sweet Pea 'Lavender Day.'

Mrs. Burnand, Uxbridge : Pelargonium 'Eva Burnand.'

Mr. T. Carlile, Twyford : Lupinus 'Thomas Carlile.'

Messrs. Cheal, Crawley : Dahlias.

A. J. Cobb, Esq., Reading : *Phlox suffruticosa* 'Victoria Improved.'

Mr. F. Collis, Brentford : Pink 'Marcia Winifred.'

Mr. Gifford, Hornchurch : Pæonies.

T. Hay, Esq., London : Calceolaria 'Albert Kent.'

Mr. H. B. Pollard, Evesham : Pyrethrum 'Pollard's Crimson.'

Messrs. Reamsbottom, West Drayton : Anemones.

Messrs. Rich, Bath : hardy plants.

Mr. J. Salmon, Wolverhampton : Pyrethrum 'Guardsman' and *Chrysanthemum maximum* 'Ideal.'

Mr. H. Vigers, Dartford : Delphiniums.

Sir Courtenay Warner, Brettenham : Carnations.

G. Yeld, Esq., Gerrard's Cross : Irises.

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Section B.

Mr. G. W. E. Loder in the Chair, and sixteen members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Ladhams, Southampton, for hardy plants.

To Messrs. Prichard, Christchurch, for hardy plants.

To Mr. G. Reuthe, Keston, for hardy plants.

To Capt. B. Symons-Jeune, London, for Saxifrages and other alpine.

Bronze Banksian Medal.

To Messrs. Jones & Ingwersen, Letchworth, for alpine.

To Messrs. Maxwell & Beale, Broadstone, for rock garden.

To Messrs. Carter Page, London, for alpine, etc.

To Messrs. Waterer, Sons & Crisp, Twyford, for Rhododendrons.

To Mr. F. G. Wood, Ashted, for hardy plants.

Award of Merit.

To *Cistus albidus* 'White form' (votes 9 for), from O. E. Warburg, Esq., Epsom. A white-flowered form of *Cistus albidus* collected in the south of France.

To *Cytisus supranubius* (votes unanimous), from Messrs. R. Veitch, Exeter. This plant, which has also been known as *Spartium nubigenum* and *Cytisus fragrans*, has proved quite hardy in Devonshire, where it has stood out of doors for 15 years. It is a native of Teneriffe and bears great quantities of small white flowers which are very sweetly scented. The curious stems are terete and striate and bear very few leaves.

To *Iris chrysographes* 'Epaulette' (votes 7 for), from Messrs. Wallace, Tunbridge Wells. A seedling from *I. chrysographes* with deep violet falls marked with yellow and white. The standards are of a paler blue colour.

To *Iris* × *Douglas* (votes 8 for), from Mr. A. Perry, Enfield. This *Iris* is, as the name indicates, the result of a cross between *I. Douglasiana* and *I. chrysographes*. Its falls stand out horizontally and are of a deep bluish-purple colour with a gold base. The small standards are also blue-purple.

To *Iris Forrestii* (votes 6 for, 2 against), from Messrs. Wallace, Tunbridge Wells. A Chinese species growing about 2 feet high with very narrow foliage and bearing yellow flowers with small brownish markings on the falls.

To *Rhododendron* 'Philip Waterer' (votes unanimous), from Messrs. Waterer, Sons & Crisp, Bagshot. This variety resulted from a cross between R. 'Mrs. Stirling' and a *R. maximum* hybrid. It bears good trusses of wide-open rose-pink flowers measuring nearly four inches across.

Other Exhibits.

Messrs. R. Bolton, Halstead : 'Lastrea' 'Wembley.'

Misses Hopkins, Shepperton : hardy plants.

R.H.S. Gardens, Wisley : *Iris tectorum*.

FLORAL COMMITTEE, JUNE 24, 1924.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and seventeen members present.

Awards Recommended :—

Gold Medal.

To Messrs. R. Bolton, Birdbrook, for Sweet Peas.

Silver-gilt Banksian Medal.

To Messrs. Bath, Wisbech, for Pæonies and Delphiniums.

To Messrs. Blackmore & Langdon, Bath, for Delphiniums.

To Messrs. Sutton, Reading, for Sweet Peas.

To Messrs. Wallace, Tunbridge Wells, for Irises, etc.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Barr, Taplow, for hardy plants.

To Messrs. B. R. Cant, Colchester, for Roses.

To Messrs. Harkness, Bedale, for Lupines, etc.

To the Orpington Nurseries, Orpington, for Irises and Delphiniums.

To Messrs. Carter Page, London, for hardy plants.

To Messrs. Peed, West Norwood, for stove plants.

Bronze Banksian Medal.

To Mr. J. C. Allgrove, Slough, for hardy plants.

To Messrs. Baker, Wolverhampton, for hardy plants.

To Mr. T. Carlile, Twyford, for Delphiniums.

To the Chalk Hill Nurseries, Reading, for miscellaneous plants.

To Mr. C. Engelmann, Saffron Walden, for Carnations.

To Messrs. Kelway, Langport, for Delphiniums.

To Messrs. J. K. King, Coggeshall, for Sweet Peas.

To Messrs. Ladhams, Southampton, for hardy plants.

To Messrs. S. Low, Enfield, for Carnations, Roses, etc.

To Major Geoffrey Lubbock, Pangbourne, for Sweet Peas.

To Mr. J. H. Pemberton, Havering-atte-Bower, for Roses.

To Messrs. Prichard, Christchurch, for hardy plants.

To Messrs. Rich, Bath, for hardy plants.

To Messrs. Russell, Richmond, for Lilies.

Award of Merit.

To Delphinium 'Norah Ferguson' (votes 9 for), from Mr. T. Carlile, Twyford. A good semi-double variety bearing its flowers on a tall, bold spike. The outer petals are pale blue, while the inner ones are violet-mauve. The eye is white.

To Pæony 'Mme. Emile Lemoine' (votes unanimous), from Messrs. Bath, Wisbech. A very large free-flowering, double white variety with a slight flush of pink on the outer petals. It is said to be a very strong grower and most reliable in blooming.

To Pæony 'Sarah Bernhardt' (votes unanimous), from Messrs. Bath, Wisbech. This, like the preceding variety, was raised by Messrs. Lemoine, France. Its rose-pink flowers are very large and of excellent form. It is reported to be an extra strong grower, reliable, and free in flowering.

Other Exhibits.

Mr. J. R. Batty, Skelton-in-Cleveland : Carnation 'Winsome Wharton.'

Mr. T. Bones, Cheshunt : Delphiniums.

Messrs. Carter, Raynes Park : Narcissus 'Carter's Late Flowering.'

Major G. W. Churcher, Lindfield : Gladioli.

Mr. C. G. Collyer, Lymington : Border Pink 'Lady Power.'

Messrs. Godfrey, Exmouth : Pelargoniums, Campanulas, etc.

Miss Hopkins, Shepperton : hardy plants.

Mrs. Horne, Queenstown : Pinks.

Messrs. Lowe & Gibson, Crawley Down : Gladioli and Irises.

Messrs. Reamsbottom, West Drayton : Anemones.

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Section B.

Mr. G. W. E. LODER in the Chair, and fifteen members present.

Awards Recommended :—

Silver Banksian Medal.

To Mr. G. Reuthe, Keston, for shrubs and hardy plants.

To Messrs. Rogers, Southampton, for hardy plants.

To Messrs. Tucker, Oxford, for hardy plants.

Bronze Banksian Medal.

To Mr. C. Turner, Slough, for shrubs.

To Messrs. Waterer, Sons & Crisp, Twyford, for hardy plants.

To Mr. W. Wells, jun., Merstham, for hardy plants.

To Mr. F. G. Wood, Ashted, for hardy plants.

First-class Certificate.

To *Cordylina × austrachis* (votes unanimous), from R. Cory, Esq., Duffryn, Cardiff. This is a handsome shrub for the warmer parts of the country. It is the result of a cross between *C. australis* and *C. Banksii erythrorachis*. The small creamy white flowers are sweetly scented and are borne in long, broad, graceful panicles.

To *Cornus Kousa chinensis* (votes unanimous), from the Royal Botanic Gardens, Kew. A deciduous hardy shrub or small tree, the chief beauty of which lies in the four large white ovate bracts which surround the inflorescence. These bracts later become tinted with pink. The leaves are ovate in shape.

Award of Merit.

To *Carpenteria californica* 'Ladhams' variety (votes 13 for), from Messrs. Ladhams, Southampton. A very vigorous, free-flowering sport from *C. californica*. The flowers are larger than those of the type and often measure $3\frac{1}{2}$ inches across.

To *Cladrastis tinctoria* (votes unanimous), from the Royal Botanic Gardens, Kew. This handsome flowering tree is a native of the south-east United States and was introduced over a century ago. It has very distinct and handsome vivid green foliage. The white leguminous flowers are slightly fragrant and are borne in terminal pendulous panicles.

To *Dimorphotheca pluvialis* (votes 6 for), from the R.H.S. Gardens, Wisley. A strong-growing annual from South Africa. It is most floriferous, and the individual flowers measure 3 inches across. The ray florets are white with a reddish-purple marking at the base, while those of the disc are golden-yellow. The

undersides of the ray florets are purplish, edged with yellow. The contrast between the reddish-purple zone surrounding the golden centre and the white rays is very striking and pleasing.

To *Genista cinerea* (votes unanimous), from the Royal Botanic Gardens, Kew. This deciduous shrub is a native of S.W. Europe. It flowers when many of the brooms are over. Its small bright yellow flowers are borne abundantly in short clusters.

To *Rhododendron crassum* (votes 6 for, 1 against), from T. H. Lowinsky, Esq., Sunninghill. An interesting species from W. Yunnan. The flowers are white and tubular, opening out to a width of nearly 3 inches at the mouth. They are borne on very short peduncles in trusses of 3 or 4. The buds are tinted with pink on the outside. The lanceolate leaves are dark green, speckled with brown underneath.

To *Rhododendron eriogynum* (votes unanimous), from T. H. Lowinsky, Esq., Sunninghill. This species was introduced by Mr. G. Forrest. It bears reddish-salmon bell-shaped flowers lightly spotted with a deeper shade.

To *Rosa mirifica* (votes unanimous), from the Royal Botanic Gardens, Kew. A species from the south-west United States. It bears rosy-mauve single flowers measuring about 2 inches across. The calyces are covered with curious pinkish spines.

The following awards recommended to *Helianthemums* on trial at Wisley were confirmed :—

Award of Merit.

2. 'The Bride' (foliage grey), sent by Mr. F. G. Wood, Ashtead.
26. 'Ben Nevis,' sent by Mr. J. Nicoll, Monifieth.
32. 'Nicoll's Apricot,' sent by Mr. W. M. Christy, Emsworth.
86. 'Ben Venue,' sent by Mr. J. Nicoll, Monifieth.

Highly Commended.

6. 'Wisley Primrose,' sent by Mr. R. C. Notcutt, Woodbridge.
27. 'Afflick,' sent by Mr. W. M. Christy, Emsworth.
33. 'Somerville's Copper' } alike, sent by Mr. W. M. Christy, Emsworth.
36. 'Copper' }
41. *H. aurantiacum* { (alike, foli- } sent by Messrs. Bakers, Wolverhampton.
43. 'Brilliant' { age grey), }
45. 'Fire Dragon' (foliage grey) sent by Wisley.
95. 'Orange' (foliage grey), sent by Mr. W. M. Christy, Emsworth.
71. 'Ben Ledi,' sent by Mr. J. Nicoll, Monifieth.

Commended.

5. *H. umbellatum*, sent by Wisley.
13. 'Goldie,' sent by Mr. W. M. Christy, Emsworth.
17. 'St. John's College Yellow' (foliage grey), sent by Mr. W. M. Christy, Emsworth.
48. *Rhodanthe carneum* { (alike, foli- } sent by Mr. W. M. Christy, Emsworth.
58. 'Wisley Pink' { age grey) sent by Mr. R. C. Notcutt, Woodbridge.
92. 'Magnificence' { alike, sent by Wisley.
93. 'Magnificent' }
35. 'Jock Scott,' sent by Mr. W. M. Christy, Emsworth.
55. 'Watergate Ruby,' sent by Mr. W. M. Christy, Emsworth.
60. 'Pink Beauty' (foliage grey), sent by Messrs. Bakers, Wolverhampton.
70. 'Ben Avon,' sent by Mr. J. Nicoll, Monifieth.

Other Exhibits.

Col. Stephenson Clarke, C.B., Cuckfield : *Kolkwitzia amabilis*. A.M., 1923.
Pterostyrax sp.

Messrs. Jones & Ingwersen, Letchworth : alpines.

Messrs. Maxwell & Beale, Broadstone : alpines.

Lt.-Col. Messel, O.B.E., Handcross : *Scopolia* No. 107 from Mt. Everest Expedition (*Scopolia lurida*).

Mr. R. C. Notcutt, Woodbridge : *Delphinium tatsienense*.

Miss Preston, Hayes : *Clematis* sp.

Messrs. Pulham, Bishops Stortford : alpines.

Sir J. F. Ramsden, Bt., Gerrard's Cross : plant from Kenya.

Messrs. Skelton & Kirby, Pirbright : alpines, etc.

G. Yeld, Esq., Gerrard's Cross : Irises.

ORCHID COMMITTEE.

JANUARY 15, 1924.

Sir JEREMIAH COLMAN, Bt., in the Chair, and nineteen members present.

Awards Recommended :—

Gold Medal.

To Messrs. J. & A. McBean, Cooksbridge, Sussex, for an excellent group, occupying 240 sq. ft., and including choice Cymbidiums and various hybrids.

Silver-gilt Flora Medal.

To H. T. Pitt, Esq., Rosslyn, Stamford Hill, for group of Odontoglossums and Cymbidiums.

Silver Flora Medal.

To Messrs. Cowan, Southgate, for Cymbidiums and Cypripediums.

To Messrs. Sanders, St. Albans, for various Orchids.

To Sir Jeremiah Colman, Bt., Gatton Park, Surrey, for meritorious hybrids.

First-class Certificate.

To *Cypripedium* × 'Memoria F. M. Ogilvie' var. 'The King' (unanimous), from G. F. Moore, Esq., Chardwar, Bourton-on-the-Water, Glos. Flower unusually large, dorsal sepal white, greenish at base, and marked with bold red-purple spots.

To *Odontioda* × 'Columbia' (*Oda.* × 'Alcantara' × *Odm.* × 'St. James') (votes 11 for), from Messrs. Charlesworth, Haywards Heath. Flowers of medium size and deep blood-red colour.

Award of Merit.

To *Cymbidium* × 'Queen of Gatton' (*insigne* × 'Lady Colman') (unanimous), from Sir Jeremiah Colman, Bt., Gatton Park, Surrey. Large flowers tinged with rose-lilac and neatly marked with purplish lines and spots.

To *Cypripedium* × 'Charlotte Dillon,' Chardwar var. ('Lady Dillon' × 'Pyramus') (unanimous), from G. F. Moore, Esq., Chardwar, Bourton-on-the-Water, Glos. This variety has a large dorsal sepal, orbicular in shape, greenish, bordered with white, and evenly spotted with blackish-purple.

Cultural Commendation.

To W. J. Naish, Esq., Pentire, Mill Road, Salisbury, for *Cypripedium* × *Leeanum* var. *Clinkaberryanum* with a dozen well-developed flowers.

Other Exhibits.

Lieut.-Col. Sir George Holford, K.C.V.O., Westonbirt: *Cypripedium* × 'Bendigo' ('Niobe' × 'Bronzino').

A. M. Gentle, Esq., Church Crescent, St. Albans: hybrid Cypripediums.

Messrs. J. Cypher & Sons, Cheltenham: hybrid Cypripediums.

Messrs. Stuart Low & Co.: *Sarcopodium cymbidioides*, with ten spikes.

Messrs. Charlesworth & Co., Haywards Heath: hybrid Orchids.

ORCHID COMMITTEE, JANUARY 29, 1924.

Sir JEREMIAH COLMAN, Bt., in the Chair, and nine members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To J. J. Bolton, Esq., Claygate Lodge, Claygate, Surrey, for Odontoglossums and Odontiodas.

Silver Banksian Medal.

To R. Gerrish, Esq., Milford Manor, Salisbury, for *Odontiodas*.
To Messrs. Cowan & Co., Southgate, for *Cattleyas* and *Brassocattleyas*.

Award of Merit.

To *Odontonia* × 'Sheila' (*Miltonia* × *Bleuana* × *Odm.* × *Lambeauianum*) (votes 6 for, 1 against), from H. T. Pitt, Esq., Rosslyn, Stamford Hill. Approaching the former parent in size and shape. Blush-white tinged with claret-red.

Other Exhibits.

G. H. Jones, Esq., Doddington: *Brassocattleya* 'Gatton Lily.'
Messrs. Sanders, St. Albans: *Cymbidium* 'Albatross.'

ORCHID COMMITTEE, FEBRUARY 12, 1924.

Sir JEREMIAH COLMAN, Bt., in the Chair, and eighteen members present.

Awards Recommended:—*Silver-gilt Banksian Medal.*

To Capt. M. Drummond, Cadland Park, Southampton, for *Coelogyne cristata* and *Cypripediums*.

To Messrs. Charlesworth & Co., Haywards Heath, for choice hybrids.

Silver Banksian Medal.

To Messrs. Sanders, St. Albans, for *Cymbidium* hybrids.

To Messrs. Stuart Low & Co., Jarvisbrook, Sussex, for rare species and hybrids.

Award of Merit.

To *Cymbidium* × 'Curlew,' Westonbirt var. ('Butterfly' × *Alexanderi*) (votes unanimous), from Lt.-Col. Sir George Holford, K.C.V.O., Westonbirt. Flowers of golden-yellow tinged with gold, lip blotched with reddish-crimson on side lobes and apex.

To *Miltonia* × 'William Pitt' var. 'The Prince' ('Isabel Sander' × *Bleuana* var. 'Reine Elizabeth') (votes unanimous), from Messrs. Charlesworth & Co., Haywards Heath. In size resembling *Bleuana*, but segments heavily tinged with rich reddish-rose.

To *Odontoglossum* × *xanthinum* (*ardentissimum xanthotes* × *luteopurpureum Vuylstekeanum*) (votes unanimous), from Messrs. Charlesworth & Co. The spike carried fifteen flowers, creamy-white, blotched and spotted with bright yellow.

Cultural Commendation and a Vote of Thanks expressing the special appreciation of the Committee.

To Sir George Kendrick (gr. Mr. MacDonald), Whetstone, Birmingham, for *Dendrobium Leeanum*, and other rarities.

Cultural Commendation.

To Mr. Lewis Smith, gr. to Capt. M. Drummond, Cadland Park, Southampton, for *Coelogyne cristata*, sixteen specimens, the best bearing 64 spikes.

Other Exhibits.

Baron Bruno Schröder, Englefield Green, Surrey: Superb varieties of *Cypripedium* × 'Eurybiades,' and *Calanthe* × 'Baron Schröder.'

Sir Jeremiah Colman, Bt., Gatton Park, Surrey: *Brassocattleya* × 'Gatton Lily' var. *majestica*, and rare species.

Sir George Kendrick, Whetstone, Birmingham: *Dendrobium* species and *Vanda tereos MacDonaldii*.

Messrs. Flory & Black, Slough: *Cypripediums* and *Cattleya* hybrids.

A. P. Cunliffe, Esq., Woodford, Salisbury: *Cymbidium* × *Alexanderi* var. 'Druid.'

At the conclusion of the meeting the Chairman referred in touching words to the loss sustained by the death of Mr. Pantia Ralli, of Ashted Park, Surrey, a successful amateur and for many years a member of the Committee. A vote of condolence was passed in silence to Mrs. Ralli.

ORCHID COMMITTEE, FEBRUARY 26, 1924

Sir JEREMIAH COLMAN, Bt., in the Chair, and fifteen members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To E. R. Ashton, Esq., Broadlands, Tunbridge Wells, for choice hybrids.

To J. J. Bolton, Esq., Claygate, Surrey, for superb *Odontoglossums* and *Odontiodas*.

Silver Banksian Medal.

To Messrs. Cowan & Co., Southgate, for various Orchids.

To Messrs. Stuart Low & Co., Jarvisbrook, Sussex, for species and hybrids.

Bronze Banksian Medal.

To Messrs. Sanders, St. Albans, for various Orchids.

First-class Certificate.

To *Miltonia* × 'William Pitt' var. 'Rosslyn' ('Isabel Sander' × *Bleuana* var. 'Reine Elizabeth') (votes unanimous), from H. T. Pitt, Esq., Stamford Hill, London, N. The finest hybrid yet seen in the *vexillaria* section, the segments being entirely covered with ruby-crimson colour, the base of the labellum lemon-yellow and with radiating lines of similar colour.

Award of Merit.

To *Odontoglossum* × 'Leander' (parentage unrecorded) (votes 11 for, 5 against), flowers of large size, segments barred and spotted with rose-purple. From R. Gerrish, Esq., Milford Manor, Salisbury.

To *Odontioda* × 'Purple Emperor' ('Coronation' × *Armstrongii*) (votes unanimous), from Messrs. Armstrong & Brown, Tunbridge Wells. Segments flatly displayed and broadly developed, of deep violet-rose colour, blotched with claret-red.

Other Exhibits.

Sir Jeremiah Colman, Bt. : *Dendrobium* × 'Lady Violet' (*Regium* × 'Lady Colman').

Messrs. J. & A. McBean : *Odontoglossum* × 'Prince Imperial' (*promerens* × 'Diamond').

ORCHID COMMITTEE, MARCH 11, 1924.

Sir JEREMIAH COLMAN, Bt., in the Chair, and sixteen members present.

Awards Recommended :—

Gold Medal.

To Lieut.-Col. Sir George Holford, K.C.V.O., Westonbirt, Glos., for a fine group of *Cymbidium* hybrids.

To Sir Jeremiah Colman, Bt., Gatton Park, Surrey, for a meritorious exhibit of *Lycaste Skinneri* in great variety

To Messrs. Sanders, St. Albans, for an extensive exhibit of *Cymbidium* hybrids.

Silver-gilt Banksian Medal.

To Messrs. Cowan & Co., Southgate, for meritorious species and hybrids.

To Messrs. Charlesworth & Co., Haywards Heath, for choice hybrids.

To Messrs. Stuart Low & Co., Jarvisbrook, Sussex, for *Cymbidiums*.

Silver Banksian Medal.

To H. T. Pitt, Esq., Stamford Hill, for interesting species and hybrids.

Award of Merit.

To *Cymbidium* × 'Linnet' (*Alexanderi* × *Holfordianum*) (votes unanimous), from Lieut.-Col. Sir George Holford, K.C.V.O., Westonbirt, Glos. Of clear olive-green colour, labellum lighter and slightly spotted.

To *Cymbidium* × 'Ring Dove' var. 'Ruby' ('Dryad' × 'Miranda') (votes 9 for), from Lieut.-Col. Sir George Holford, K.C.V.O., Westonbirt, Glos. Flowers rose-pink in colour, the expansive labellum boldly marked with dark crimson spots and a median line.

To *Cymbidium* × 'Macaw' (parentage unrecorded) (votes 14 for), from Lieut.-Col. Sir George Holford, K.C.V.O., Westonbirt, Glos. Of crimson-brown tint, the labellum having a V-shaped blotch of deep crimson.

To *Cymbidium* × 'President Wilson,' Westonbirt var. (*Lowianum* × *Alexanderi*) (votes 13 for, 1 against), from Lieut.-Col. Sir George Holford, K.C.V.O., Westonbirt, Glos. Large flowers of bronze colour stained with red, labellum cream-yellow and with an intense crimson V-shaped blotch.

To *Cymbidium* × 'Redstart' var. 'Rosy Gem' ('Dryad' × *Pauwelsii*) (votes unanimous), from Lieut.-Col. Sir George Holford, K.C.V.O., Westonbirt, Glos. Flower of rose colour, the broad labellum white, speckled with rose on the margin, crest yellow.

To *Cymbidium* × 'Ceres' var. *rubrum* (*I'Ansonii* × *insigne*) (votes 16 for), from Messrs. J. & A. McBean, Cooksbridge, Sussex. Large flowers of reddish-rose colour, and delicate veining of lighter tints.

To *Cymbidium* × *Alexanderi* var. 'The Princess' (votes 9 for, 1 against), from Messrs. J. & A. McBean, Cooksbridge, Sussex. Large flowers, segments broadly developed, of rose-pink colour, labellum margined with rose-crimson.

To *Odontioda* × 'The Torch' (*Odm. ardentissimum* × *Oda.* × *Sanderae*) (votes unanimous), from Messrs. Sanders, St. Albans. Segments broadly developed and of crimson-rose colour.

Cultural Commendation.

To Messrs. J. & A. McBean, Cooksbridge, for a superb example of *Laelio-cattleya* × 'Eunice' *alba* var. 'Constance,' with nine flowers.

Other Exhibits.

Baron Bruno Schröder, Englefield Green: *Cattleya* × 'Minnehaha' (*Trianae* × 'Lady Rowena').

Richard G. Thwaites, Esq., Streatham Hill: *Odontoglossum* × *Goveri* var. 'swietinicolor.'

ORCHID COMMITTEE, MARCH 26, 1924.

C. J. LUCAS, Esq., in the Chair, and sixteen members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Stuart Low & Co., for rare species and hybrids.

Silver Banksian Medal.

To H. T. Pitt, Esq., Rosslyn, Stamford Hill, London, N., for various Orchids.

To Messrs. Sanders, for species and hybrids.

First-class Certificate.

To *Odontoglossum* × *eximium*, McBean's var. Flowers unusually large, the broadly developed segments heavily blotched with reddish-purple. From Messrs. J. & A. McBean, Cooksbridge, Sussex.

Award of Merit.

To *Cymbidium* × 'Kittiwake,' Holford's var. ('Dryad' × *Gottianum*) (votes unanimous). Flowers porcelain-white, the labellum lined and spotted with crimson-red on the apical portion. From Lieut.-Col. Sir George Holford, K.C.V.O., Westonbirt, Glos.

To *Cymbidium* × *Alexanderi* var. 'Edusa' (votes 9 for, 3 against). A large flower, bluish tinted, the labellum marked with reddish colour. From the Hon. Henry D. McLaren, Bodnant, N. Wales.

To *Odontoglossum* × 'Model' ('Aglaon' × *promerens*) (votes unanimous). Flowers well-proportioned, rose flushed and marked with purple-brown. From J. J. Bolton, Esq., Claygate, Surrey.

IX PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

To *Brassocattleya* × 'The Globe' (*B.-c.* × *Cliftonii magnifica* × *C. Trianae* 'The Baron') (votes unanimous). Flowers of model form, rose-pink, the labellum mauve-purple and crisped at the margin. From Messrs. Armstrong & Brown, Tunbridge Wells.

Botanical Certificate.

To *Ophrys atrata*, collected in Syracuse by the exhibitor, Major Albert Pam, Wormley, Bury, Broxbourne. About fifteen healthy plants, with eleven erect flower-spikes, were growing in a shallow pan.

Other Exhibits.

J. J. Joicey, Esq.: *Odontioda* × 'Pekoe' (*Oda.* 'Coronation' × *Odm. splendens*), with scarlet freckling on the segments.

R. Gerrish, Esq., Milford Manor, Salisbury: *Odontoglossum* × 'J. H. Knight', blotched with claret-purple.

Messrs. Armstrong & Brown, Tunbridge Wells: *Cattleya* × 'White Queen' (*Trianae* × 'Irene').

ORCHID COMMITTEE, APRIL 8, 1924.

Sir JEREMIAH COLMAN, Bt., in the Chair, and fifteen members present.

Awards Recommended:—

Gold Medal.

To Messrs. Sanders, St. Albans, for extensive exhibit of Orchids.

Silver-gilt Banksian Medal.

To Sir Jeremiah Colman, Bt., Gatton Park, Surrey, for group of species and hybrids.

To H. T. Pitt, Esq., Rosslyn, Stamford Hill, N., for collection of species and hybrids.

Silver Banksian Medal.

To Messrs. Stuart Low & Co., Jarvisbrook, Sussex, for various Orchids.

To Messrs. Charlesworth & Co., Haywards Heath, Sussex, for a selection of hybrids.

Award of Merit.

To *Laeliocattleya* × 'Orange Blossom' var. 'June' (*L.-c.* × 'Elinor' × *L.-c.* × 'Trimyra'), (votes 8 for, 4 against), from Lieut.-Col. Sir George Holford, K.C.V.O., Westonbirt, Glos. Flowers of medium size, in colour bright orange-yellow, tinged with gold, equally suffused throughout all the segments.

To *Odontoglossum* × 'Duke of York' (*percultum* × *illustrissimum*) (votes 15 for), from R. Gerrish, Esq., Milford Manor, Salisbury. Segments roundly formed and bearing solid blotches of an unusual violet-rose colour, in which a bluish tinge is visible.

To *Wilsonara* × 'Wendy' var. 'Cardinal' (*Odm.* × *Lambeaurianum* × *Oncidioda* × *Cooksoniae*) (votes 8 for, 3 against), from Messrs. Charlesworth & Co. This trigeneric hybrid bore an erect spike of fourteen large flowers, the segments broadly developed and entirely rich cardinal-red in colour.

To *Orchis papilionacea* (votes 12 for), from Major Albert Pam, Wormley, Bury, Broxbourne. Several examples of this terrestrial species were shown growing in a shallow pan. The broadly developed labellum is prettily lined and marked with deep mauve.

To *Odontoglossum crispum* var. 'Mary Gratrix' (votes 10 for, 4 against), from Messrs. Sanders. An imported plant of Pacho type. The spike bore nine large flowers of round form, white, with a few spots on the labellum.

To *Cymbidium* × *Coningsbyanum* var. 'Mammoth' (*grandiflorum* × *insigne*) (votes 9 for), from Messrs. Sanders.

Cultural Commendation.

To Messrs. Sanders, for the above plant of *Cymbidium* × *Coningsbyanum*.

To Mr. F. Streeter, gardener to Major Albert Pam, for *Ophrys lutea*, several robust plants of which were staged together in a shallow pan.

Other Exhibits.

W. Van der Weyer, Esq., Corfe Castle, Dorset: an *Ophrys* species from Portugal.

Messrs. Flory & Black, Slough: *Cattleya* × 'Prince Shimadzu' var. *magnifica*, a large, richly coloured flower.

R. Gerrish, Esq., Salisbury: *Odontoglossum* × 'Amillus,' of distinct character.

Lieut.-Col. Sir George Holford, K.C.V.O.: *Cymbidium* × 'Merlin,' previously given a First-class Certificate.

ORCHID COMMITTEE, APRIL 29, 1924.

Sir JEREMIAH COLMAN, Bt., in the Chair, and seventeen members present.

Awards Recommended :—*Gold Medal.*

To Messrs. J. & A. McBean, Cooksbridge, Sussex, for large group of species and hybrids.

Silver Banksian Medal.

To Messrs. Stuart Low & Co., for group.

First-class Certificate.

To *Cattleya* × 'Prince Shimadzu' var. 'Titanic' (*Hardyana* × 'Tityus') (votes unanimous), from Messrs. Flory & Black, Slough. One of the finest of *Cattleyas*, segments broadly developed and richly coloured.

To *Odontioda* × 'Ganesa' Gerrish's var. (*Oda. Brewii* × *Odm.* 'President Poincaré') (votes unanimous), from R. Gerrish, Esq., Milford Manor, Salisbury. Of fine formation and dark crimson colour.

Award of Merit.

To *Odontioda* × *Joiceyi* var. 'John Cowan' (*Oda.* 'Coronation' × *Odm.* *promerens*) (votes 11 for), from J. J. Bolton, Esq., Claygate, Surrey. Flowers of rich claret-crimson colour, the segments margined with white.

To *Milionia* × 'Beau Brummell' (*Bleuana* var. 'Queen Elizabeth' × 'Venus') (votes 11 for), from H. T. Pitt, Esq., Stamford Hill, N. Flowers resembling those of *M. Bleuana*, light rose, inner halves of segments violet-purple, base of labellum reddish.

To *Odontoglossum* × 'Syrinx' var. 'Helius' (*crispum xanthotes* × *waltonense*) (votes 12 for, 1 against), from Messrs. J. & A. McBean, Cooksbridge, Sussex. Considered to be the finest light-yellow hybrid *Odontoglossum*.

Cultural Commendation.

To Mr. Lewis Smith, gardener to Capt. Maldwin Drummond, Cadland Park, Southampton, for *Maxillaria Harrisoniae*, with a total of eighteen flowers.

Other Exhibits.

H. T. Pitt, Esq., Stamford Hill, N.: various species.

Messrs. Charlesworth & Co.: *Odontonia* × 'Olivia' and *Vuylstekeara* × *Rutherfordii*.

Messrs. Sanders: *Cymbidiums* and *Odontioda* × 'Grenadier' var. 'Empire.'

ORCHID COMMITTEE, MAY 13, 1924.

Sir JEREMIAH COLMAN, Bt., in the Chair, and twelve members present.

Awards Recommended :—*Silver Banksian Medal.*

To Messrs. Stuart Low & Co., Jarvisbrook, Sussex, for group of various species and hybrids.

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Award of Merit.

Cypripedium Godefroyae leucochilum giganteum, from Sir Jeremiah Colman, Bt., Gatton Park, Surrey. Flower above average size, honey-yellow colour, sepals and petals marked with maroon.

Botanical Certificate.

To *Dendrobium laevifolium*, from Sir Jeremiah Colman, Bt. Plant densely tufted in habit, bearing numerous short spikes each with from two to three flowers of deep-rose colour.

Other Exhibits.

Lady Aberconway and the Hon. Henry D. McLaren: *Cypripedium* × 'Virgo' ('Psyche' × *Godefroyae*).

Messrs. Charlesworth & Co.: *Odonioda* × 'Cornelia.'

NARCISSUS AND TULIP COMMITTEE.

FEBRUARY 12, 1924.

Mr. E. A. BOWLES, M.A., V.M.H., in the Chair, and nine members present.

Award Recommended :—

Silver Banksian Medal.

To Messrs. Bath, for a group of Narcissi and Tulips.

NARCISSUS AND TULIP COMMITTEE, FEBRUARY 26, 1924.

Mr. E. A. BOWLES, M.A., V.M.H., in the Chair, and sixteen members present.

Mr. Jacob suggested that the Committee should invite Mr. Alister Clarke on his arrival in England to serve on the Narcissus Committee, and Mr. Bowles promised to bring this forward at the meeting of the Council.

Mr. Chittenden read a memorandum upon the proposed Daffodil trial at Wisley, and it was recommended that all bulbs received at Wisley should be treated by the hot-water bath method; that a minimum of 3 and a maximum of 6 bulbs of each variety should be sent; that only one-nosed or apparently one-nosed bulbs should be accepted; that August 12 should be the latest date on which bulbs should be received; and that the trial should be judged for general purposes.

Award Recommended :—

Gold Medal.

To Messrs. Bath, for a group of forced bulbs.

NARCISSUS AND TULIP COMMITTEE, MARCH 11, 1924.

Mr. E. A. BOWLES, M.A., V.M.H., in the Chair, and fourteen members present.

Awards Recommended :—

Gold Medal.

To Messrs. Sutton & Sons, for Tulips.

Silver-gilt Banksian Medal.

To Messrs. J. R. Pearson, for Daffodils.

Bronze Banksian Medal.

To Messrs. J. Carter, for Narcissi.

To Messrs. Bath, for Tulips and Narcissi.

NARCISSUS AND TULIP COMMITTEE, MARCH 25, 1924.

Mr. E. A. BOWLES, M.A., V.M.H., in the Chair, and twenty-one members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs Barr & Sons, for Daffodils.

Silver Banksian Medal.

To Messrs. J. R. Pearson, for Daffodils and Tulips.

To Messrs. Bath, for Tulips.

To Messrs. Cuthbert & Son, for Tulips.

Bronze Banksian Medal.

To the Maytham Gardens, Rolvenden, for Tulips.

Award of Merit.

To *Narcissus* 'Auguste' (votes 8 for), a striking Barrii variety. From Mr. P. D. Williams.

To *Narcissus* 'Adela' (votes 13 for), a fine Leedsii variety with pure white perianth segments. From Mr. P. D. Williams.

To *Narcissus* 'Killigrew' (votes unanimous), an *incomparabilis* variety of merit. From Mr. P. D. Williams.

To *Narcissus* 'Hesla' (votes 12 for), a distinct variety containing *Narcissus Jonquilla* blood. From Mr. P. D. Williams.

NARCISSUS AND TULIP COMMITTEE, APRIL 8, 1924.

Mr. E. A. BOWLES, M.A., V.M.H., in the Chair, and twenty members present.

Awards Recommended :—

Gold Medal.

To Messrs. Bath, for Tulips.

Silver-gilt Banksian Medal.

To Messrs. Dobbie, for Tulips.

To Messrs. Barr, for Daffodils.

Silver Banksian Medal.

To Messrs. Cuthbert, for Tulips.

Bronze Banksian Medal.

To the Maytham Gardens, for Tulips

First-class Certificate.

To *Narcissus* 'Fortune' (voting unanimous), a perfectly formed *incomparabilis* variety of yellow colouring and orange-yellow crown. From Messrs. Walter T. Ware Ltd., Bath.

NARCISSUS AND TULIP COMMITTEE, APRIL 15, 1924.

(London Daffodil Show.)

Mr. E. A. BOWLES, M.A., V.M.H., in the Chair, and twenty-one members present.

Awards Recommended :—

Award of Merit.

To *Narcissus* 'Nevis' (votes 11 for), a white Trumpet show variety. From Messrs. Herbert Chapman.

To *Narcissus* 'Everest' (votes unanimous), an excellent white Trumpet show variety. From the Donard Nursery Co.

To *Narcissus* 'Tenedos' (votes 18 for), a giant Leedsii with cream segments and pale citron trumpet.

NARCISSUS AND TULIP COMMITTEE, APRIL 29, 1924.

Mr. GEORGE MONRO in the Chair, and twenty-one members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Barr, for Narcissi.

To the Donard Nursery Co., for Narcissi.

To Messrs. Bath, for Narcissi.

To Messrs. Sutton & Sons, for Narcissi.

Silver Banksian Medal.

- To Messrs. Herbert Chapman, for Narcissi.
- To the Welsh Bulb Fields, for Narcissi.
- To Messrs. Pearson, for Narcissi.
- To Messrs. James Carter, for Tulips.

Bronze Banksian Medal.

- To Messrs. W. P. Downes, for Narcissi.

NARCISSUS AND TULIP COMMITTEE, MAY 13, 1924.

Mr. E. A. BOWLES, M.A., V.M.H., in the Chair, and twenty members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

- To Messrs. Bath, for Tulips.
- To Messrs. Barr, for Daffodils.

Silver Banksian Medal.

- To Messrs. Pearson, for Daffodils.
- To Messrs. Barr, for Tulips.

EXTRACTS FROM THE PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

JULY 8, 1924.

Mr. R. W. ASCROFT in the Chair.

One hundred and seventy-one Fellows and one Associate were elected, and two Societies affiliated.

A lecture was given by Dr. A. B. Rendle, F.R.S., V.M.H., on "Plants of Interest in the Show."

The Clay Challenge Cup, for a new Rose bearing the true Old Rose Scent, was awarded to Messrs. Laxton Bros., Bedford, for 'Bedford Crimson.'

GENERAL MEETING.

JULY 22, 1924.

Sir WILLIAM LAWRENCE, Bt., in the Chair.

Sixty Fellows and four Associates were elected, and two Societies affiliated.

GENERAL MEETING.

AUGUST 12, 1924.

The Rt. Hon. The Lord LAMBOURNE, P.C., V.M.H., in the Chair.

Seventy-two Fellows were elected, and one Society affiliated.

DEPUTATION TO ABERDEEN SHOW.

AUGUST 14-16, 1924.

A deputation of the Council of the Society visited Aberdeen on August 14, 1924, and made awards as shown below. The deputation consisted of Sir Wm. Lawrence, Bt. (Treasurer), Messrs. W. Cuthbertson, V.M.H., C. T. Musgrave (members of Council), and W. R. Dykes, M.A. (Secretary).

Gold Medal.

To Mr. J. A. Grigor, Banff, for Sweet Peas.

To Messrs. Dobbie, Edinburgh, for Roses.

To Messrs. B. Reid, Aberdeen, for a most meritorious exhibit.

To Messrs. W. Smith, Aberdeen, for a most meritorious exhibit.

lxx PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

Silver-gilt Flora Medal.

To Col. W. S. Gill, Bieldside, for Roses.
To Rt. Hon. Viscountess Cowdray, Dunecht, for foliage and specimen plants.
To Mr. M. H. Sinclair, Aberdeen, for a meritorious exhibit.

Silver-gilt Banksian Medal.

To Messrs. Adam & Craigmile, Rubislaw, for Roses and exhibition flowers.

Silver-gilt Hogg Medal.

To the Carse of Gowrie Nursery Co., Errol, for fruit.

Silver Flora Medal.

To Mr. J. Smith, Darvel, for border Carnations.
To Mr. J. Cook, Aberdeen, for flowering foliage plants.
To Mr. A. Robertson, Aberdeen, for Zonal Pelargoniums.
To Mr. A. Masson, Aberdeen, for pot plants.
To Messrs. D. & W. Croll, Dundee, for Roses.

Silver Hogg Medal.

To Mr. T. L. Adam, Denmore, for Strawberries.
To Messrs. W. Duncan, Aberdeen, for hardy fruits.

Silver Banksian Medal.

To Mrs. E. R. Watson, Oldmeldrum, for Roses.
To Mr. G. Florence, Tillyfourie, for Pansies and Violas.

Silver Knightian Medal.

To Col. D. B. D. Stewart, Aberdeen, for vegetables.

Silver Lindley Medal.

To the Cruickshank Botanic Garden, Aberdeen, for plants of botanical interest.

Bronze Flora Medal.

To Mr. J. M. Dunn, Aberdeen, for Fuchsias.

Bronze Hogg Medal.

To Rt. Hon. Lord Semphill, Aberdeen, for fruits.

Veitch Memorial Medal and £5.

To Rt. Hon. Viscountess Cowdray, Dunecht, for best exhibit of fruits.

GENERAL MEETING.

AUGUST 26, 1924.

The Rt. Hon. The Lord LAMBOURNE, P.C., V.M.H., in the Chair.

Fifty-three Fellows and one Associate were elected, and two Societies affiliated.

GENERAL MEETING.

SEPTEMBER 9, 1924.

The Rt. Hon. The Lord LAMBOURNE, P.C., V.M.H., in the Chair.

Thirty-four Fellows were elected.

The Foremarke Cup and Silver Lindley Medal.

Awarded to Mr. D. Whitlaw, Station House, Lawrence Kirk, for Gladioli.

HOLLAND PARK SHOW.

SEPTEMBER 23-25, 1924.

LIST OF JUDGES.

AUTON, W.	HAY, T., V.M.H.	SCOTT, F. W.
BALFOUR, F. R. S.	HOSKING, A.	SMITH, A. C.
BEAN, W. J., V.M.H.	JOHNSTON, MAJOR L.	SMITH, W. T.
BLAKEY, W. J.	LINDSAY SMITH, MRS.	STEVENSON, T.
COBB, A. J.	LUCAS, C. J.	TIPPING, H. A.
COOKSON, CLIVE	METCALFE, A. W.	TITCHMARSH, C. C.
CUNNINGHAM, H.	MURRELL, O.	WALLACE, W. E.
FIELDER, C. R., V.M.H.	POUPART, J.	WIGHTMAN, MRS.
HALES, WM.	PUDDLE, F. C.	WILSON, G.
HANBURY, F. J.	SAWDAY, G. C.	WILSON, J.

List of Awards.

CHALLENGE CUPS.

Coronation Cup.

To the Hon. Vicary Gibbs (gr. E. Beckett), for the most meritorious group.

Wigan Cup.

To Mr. Elisha J. Hicks, for the best exhibit of Roses.

GREENHOUSE PLANTS, ETC.

Gold Medal.

To Messrs. Blackmore & Langdon, for Begonias.

To Messrs. Sutton, for Gloxinias.

Silver-gilt Flora Medal.

To Mr. S. Smith, for Cacti.

Silver Banksian Medal.

To Messrs. J. Carter, for Lilies.

To Miss S. S. Thompson, for Cacti.

Bronze Flora Medal.

To Messrs. Godfrey, for Zonal Pelargoniums.

To Messrs. W. H. Simpson, for Antirrhinums.

SHRUBS.

Silver Cup.

To Messrs. Hillier, for conifers, Chinese shrubs, etc.

Silver-gilt Flora Medal.

To Messrs. A. Charlton, for ornamental trees and shrubs.

To Messrs. J. Cheal, for ornamental trees and shrubs.

To Messrs. Robert Green, for palms and bay trees.

To Messrs. J. Waterer, Sons & Crisp, for specimen trees and shrubs.

Silver-gilt Banksian Medal.

To Messrs. Fletcher Bros., for conifers and berried plants.

To Mr. R. C. Notcutt, for ornamental flowering and foliage shrubs.

Silver Flora Medal.

To Messrs. Maxwell & Beale, for hardy heathers.

Silver Banksian Medal.

To Messrs. R. & G. Cuthbert, for conifers and hardy Ericas.

To Mr. John Klipkert, for clipped yew and box trees.

ORCHIDS.

Gold Medal.

- To Messrs. Stuart Low, for Orchids.
- To Messrs. Sanders, for Orchids.

Silver-gilt Flora Medal.

- To Messrs. Charlesworth, for Orchids.
- To Messrs. Flory & Black, for Orchids.

DAHLIAS.

Silver Cup.

- To Messrs. Dobbie, for Dahlias.
- To Mr. H. J. Jones, for Dahlias.

Silver-gilt Flora Medal.

- To Messrs. Carter Page, for Dahlias.
- To Mr. J. B. Riding, for Dahlias.
- To Mr. J. T. West, for Dahlias.

Silver-gilt Banksian Medal.

- To Messrs. W. Treseder, for Dahlias.
- To Messrs. J. Stredwick, for Dahlias.

Silver Flora Medal.

- To Mr. C. Turner, for Dahlias.

Silver Banksian Medal.

- To Messrs. J. Cheal, for Dahlias and herbaceous.

MICHAELMAS DAISIES, ETC.

Silver Cup.

- To Mr. H. J. Jones, for Michaelmas Daisies.

Silver-gilt Flora Medal.

- To Messrs. Dickson & Robinson, for Michaelmas Daisies.
- To Messrs. K. Luxford, for Chrysanthemums.

Silver-gilt Banksian Medal.

- To Mr. E. Ballard, for Michaelmas Daisies.

Silver Flora Medal.

- To Messrs. Wm. Cutbush, for Michaelmas Daisies.
- To Mr. W. Yandell, for Violas and Chrysanthemums.

Silver Banksian Medal.

- To Messrs. W. Wells, for Chrysanthemums.
- To Mr. W. Wells, jun., for Michaelmas Daisies.

Bronze Flora Medal.

- To Mr. H. Hemsley, for Michaelmas Daisies and herbaceous.
- To Mr. J. J. Kettle, for Violets.
- To Mr. B. Pinney, for Violets.

ROSES.

Gold Medal.

- To Mr. Elisha J. Hicks, for Roses.

Silver Cup.

- To Mr. G. Prince, for Roses.
- To Mr. J. Robinson, for Roses.

Silver-gilt Flora Medal.

- To Messrs. B. R. Cant, for Roses.
- To Mr. W. E. Chaplin, for Roses.
- To Messrs. McGredy, for Roses.
- To Messrs. D. Prior, for Roses.

Silver-gilt Banksian Medal.

To Messrs. A. J. & C. Allen, for Roses.
To Mr. J. H. Pemberton, for Roses.

Silver Flora Medal.

To Messrs. F. Cant, for Roses.
To Messrs. J. Waterer, Sons & Crisp, for Roses.
To Mr. J. Mattock, for Roses.

Silver Banksian Medal.

To Mr. A. Warner, for Roses.

Bronze Flora Medal.

To Mr. H. Drew, for Roses.
To Mr. T. P. Edwards, for Roses.

FRUIT AND VEGETABLES.

Gold Medal.

To Mr. J. C. Allgrove, for fruit trees and gathered fruit.
To the Hon. Vicary Gibbs (gr. E. Beckett), for vegetables.

Silver Cup.

To Messrs. G. Bunyard, for fruit.

Silver-gilt Hogg Medal.

To Barnham Nurseries, for fruit.
To Horticultural College, Swanley, for fruit.
To Messrs. Laxton Bros., for fruit.
To Messrs. T. Rivers & Son, for fruit trees in pots.
To Studley College, for fruit.
To Messrs. J. Waterer, Sons & Crisp, for fruit trees in pots.

Silver Hogg Medal.

To Messrs. S. Spooner, for fruit.
To Messrs. Daniels Bros., for fruit.

Bronze Hogg Medal.

To Mr. E. J. Parsons, for fruit.

CARNATIONS.

Gold Medal.

To Mr. C. Engelmann, for Carnations.

Silver-gilt Flora Medal.

To Messrs. Allwood Bros., for Carnations.
To Messrs. Stuart Low, for Carnations.

MIXED GROUPS AND HERBACEOUS PLANTS.

Silver Cup.

To Messrs. R. Wallace, for herbaceous flowers, conifers, Lilies, etc.

Silver-gilt Flora Medal.

To Messrs. R. H. Bath, for Gladioli.
To Mr. J. McDonald, for grass garden.
To Messrs. Blackmore & Langdon, for Delphiniums and herbaceous plants.
To Messrs. L. R. Russell, for Clematis.
To Messrs. Clarence Elliott, for alpine plants and shrubs.

Silver-gilt Banksian Medal.

To Messrs. Austin & McAslan, for Gladioli.
To Messrs. Dobbie, for Gladioli.
To Messrs. Bakers, for herbaceous and alpine plants.
To Messrs. Bowell & Skarratt, for herbaceous and alpine plants.
To Central Garden Supplies, for mixed group.
To Mr. G. G. Whitelegg, for herbaceous and alpine plants.

To Mr. F. G. Wood, for herbaceous and alpine plants.
 To Messrs. G. Gibson, for herbaceous plants.
 To Messrs. Isaac House, for Scabious and Tritomas.
 To Messrs. G. Jackman, for Clematis and herbaceous plants.
 To Messrs. Jones & Ingwersen, for alpine plants and shrubs.
 To Messrs. Maxwell & Beale, for mixed group.
 To Mr. Amos Perry, for Lilies, herbaceous plants, etc.
 To Mr. G. Reuthe, for herbaceous plants and shrubs.

Silver Flora Medal.

To Mr. A. Edwards, for Gladioli.
 To Messrs. Lowe & Gibson, for Gladioli.
 To Mr. T. Cailile, for herbaceous plants.
 To French Intensive Gardens, for ornamental grasses and everlasting flowers.
 To Messrs. Harkness & Sons, for herbaceous plants.
 To Messrs. Godfrey, for herbaceous plants.
 To Messrs. B. Ladhams, for Lobelias, etc.
 To Chalk Hill Nurseries, for herbaceous plants and Poppies.
 To Messrs. Rich, for herbaceous cut flowers.

Silver Banksian Medal.

To Orpington Nurseries Co., for Gladioli.
 To Mr. E. Dixon, for alpine and herbaceous plants.
 To Messrs. J. Forbes, for Phlox and Pentstemons.
 To Messrs. W. H. Rogers, for alpines, alpine shrubs, and perennials.

Bronze Flora Medal.

To Messrs. Reamsbottom, for St. Brigid Anemones.

GENERAL MEETING.

OCTOBER 7, 1924.

Sir WILLIAM LAWRENCE, Bt., in the Chair.

One hundred and fifty Fellows and eleven Associates were elected, and four Societies affiliated.

A Conference was held on New Apples and Pears.

R.H.S. FRUIT AND VEGETABLE SHOWS.

OCTOBER 7 AND 8, 1924.

FRUIT SHOW.

LIST OF JUDGES.

ALLGROVE, J. C.	HARRISS, E.	PATEMAN, T.
BARNES, N. F., V.M.H.	HOWE, W.	PEARSON, A. H., V.M.H.
BASHAM, J.	JORDAN, F.	PRINCE, H.
BATES, W.	KELF, G.	RIVERS, H. S.
BULLOCK, A.	LAXTON, E. A. L.	SMITH, A. C.
CHEAL, J., V.M.H.	MCLEOD, J. F.	VEITCH, P. C. M., V.M.H.
COBB, A. J.	MARKHAM, E.	VERT, J.
CRUMP, W., V.M.H.	MARKHAM, H.	WESTON, J. G.
DIVERS, W. H., V.M.H.	METCALFE, A. W.	WILSON, J.
FIELDER, C. R., V.M.H.	NEAL, E.	WOODWARD, G.

Chief Awards.

Class 1.—Amateurs. Collection of ripe dessert fruits.

First Prize.

To Capt. M. Drummond (gr. Mr. L. Smith).

Class 14.—Trade. Collection of hardy fruits.

Gold Medal.

To Mr. J. C. Allgrove.

Class 16.—Market Growers. 12 British standard boxes of Apples.

Gold Medal.

To Hollesley Bay Colony.

Affiliated Societies Challenge Cup, for Apples and Pears.

To North Walsham and District Horticultural Society.

George Munro Memorial Cup, for the best exhibit of Grapes by an Amateur.

To Sir William Lawrence, Bt. (gr. Mr. J. Brown).

Gordon-Lennox Cup, for the most meritorious display of Fruit by an Amateur.

To Sir Charles Nall-Cain (gr. Mr. T. Pateman).

VEGETABLE SHOW.

LIST OF JUDGES.

BECKETT, E., V.M.H.
GIBSON, J.
GILES, W. F.
IRELAND, A.

JANES, E. R.
LOBJOIT, W. J.
MESSENGER, W.
MIDDLETON, C. H.

POUPART, J.
PRITCHARD, W. J.
STEWART, W.
VINE, J. E.

Chief Awards.

Class 1.—Amateurs. Collection of vegetables.

First Prize, Sutton Cup.

To Major A. Pam (gr. Mr. F. Streeter).

R.H.S. Challenge Cup, for highest number of points gained at the Show.

To Mrs. Jenner (gr. Mr. H. Wheeler), 22 points.

GENERAL MEETING.

OCTOBER 21, 1924.

The Hon. H. D. MACLAREN in the Chair.

Sixty Fellows and twenty Associates were elected, and one Society affiliated.

A lecture was given by Dr. A. W. Hill, Sc.D., F.R.S., on "The Imperial College of Tropical Agriculture, Trinidad."

ORCHID SHOW AWARDS.

Large Silver Cup.

To Lt.-Col. Sir George Holford (gr. Mr. H. G. Alexander).

Small Silver Cup.

To Mr. J. J. Joicey.

Gold Medal.

To Messrs. Sanders.

To Messrs. J. & A. McBean.

Silver-gilt Lindley Medal.

To Lt.-Col. Sir George Holford.

Silver-gilt Banksian Medal.

To Messrs. S. Low.

To Mr. H. T. Pitt (gr. Mr. Thurgood).

To Sir Jeremiah Colman, Bt., V.M.H. (gr. Mr. J. Collier).

To Messrs. Cowan.

lxxvi PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

Silver Banksian Medal.

To Messrs. Cypher.

To Mr. H. Dixon.

Bronze Banksian Medal.

To Mr. L. Dixon.

Special Vote of Thanks.

To Messrs. Armstrong & Brown.

IMPERIAL FRUIT SHOW, BIRMINGHAM.

OCTOBER 24, 1924.

Gold Medal.

Class 18.—Messrs. B. Bomford, for Pears.

Class 19.—Mr. G. D. Laurens, for Pears.

GENERAL MEETING.

NOVEMBER 4, 1924.

Mr. C. G. A. Nix, V.M.H., in the Chair.

Fifty-seven Fellows and one Associate were elected, and one Society affiliated.

A lecture was given by Mr. D. Cuthbertson on "The Relation of Leaf and other Diseases of the Potato to the Crop." (See p. 21.)

GENERAL MEETING.

NOVEMBER 18, 1924.

The Rt. Hon. The Lord LAMBOURNE, P.C., V.M.H., in the Chair.

Seventy-six Fellows and one Associate were elected.

A lecture was given by Mr. A. L. Wettern on "The Rose Trial Garden at Wisley."

GENERAL MEETING.

DECEMBER 2, 1924.

Dr. A. B. RENDLE, F.R.S., V.M.H., in the Chair.

Twenty-nine Fellows were elected, and four Societies affiliated.

A lecture was given by Miss Saunders on "Some Conceptions of the Leaf-Member, Old and New" (p. 241).

GENERAL MEETING.

DECEMBER 16, 1924.

The Rt. Hon. The Lord LAMBOURNE, P.C., V.M.H., in the Chair.

Forty-three Fellows and one Associate were elected, and two Societies affiliated.

SCIENTIFIC COMMITTEE.

JULY 8, 1924.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, ten other members and Mr. M. B. CRANE (visitor) present.

Gall on Rhododendron ferrugineum.—Mr. Cory sent from Duffryn foliage of *Rhododendron ferrugineum* attacked by the fungus *Exobasidium Rhododendri*, forming reddish galls upon the leaves.

Tuber growing.—Dr. Voelcker showed again a large tuber which was at first thought to be a Dioscorea, but which proved to be a leguminous plant now flowering, after being dry for two years (see p. lxxix).

Pollination of Cherries.—Mr. C. H. Hooper showed charts to illustrate the order of flowering of cherries, and the self-fertile and self-sterile varieties. The importance of correct nomenclature in any recommendations that might be made was commented upon.

Habenaria aberrant.—Mr. Fraser made some remarks upon the aberrant *Habenaria*, which Mr. P. Bunyard showed at a recent meeting from plants which he had exhibited last year. He found it had four additional anthers.

Galls on Willow.—Mr. Fraser also showed galls on *Salix undulata*, due to the attack of *Eriophyes triradiatus*.

Various plants.—Mr. Arkwright showed *Geranium pratense* var. *striatum*; a *Viola* which does not seed; *Jasminum officinale* grafted upon *J. nudiflorum*; a number of kinds of hybrid origin of various colours except cream. Mr. Hosking showed *Allium* sp., *Silene* sp., *Camelina sativa*, *Caucalis*, *Asperula setosa*, *Anihemis tinctoria*, *Bromus* sp., *Romeria* hybrids, *Glaucium phoeniceum*, *Papaver Rhoeas*, *P. hybridum*, *Sisymbrium pannonicum*.

Fasciated Sempervivum.—Mr. Preston showed a fasciated *Sempervivum*, with a flattened fan-shaped stem, nine or ten inches in diameter. He also showed fruiting specimens of *Nuttallia cerasiformis*.

Plants from the Mediterranean district.—Mr. Bowles showed a number of plants in flower which he had collected in Algeria, including *Echium pomponium*, *E. calycinum*, *Cynoglossum cheirifolium*, *Biarum tenuifolium*.

SCIENTIFIC COMMITTEE, JULY 22, 1924.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and fourteen other members present.

Digitalis.—Mr. A. Hosking showed a pale yellow form of *Digitalis purpurea* called 'Primrose Queen,' *D. lutea*, and a hybrid between *D. lutea* and *D. purpurea*, *D. Buxbaumii* which was like the last, Ryders' hybrids of which *D. ambigua* appears to be a parent, *D. lanata*, *D. ferruginea gigantea*, and another species with fuscous flowers.

Sidalceas.—Mr. Hemsley of Crawley showed a series of seedling *Sidalceas*, hybrids of *malvasiflora* and *Listeri*, showing several uncommon shades. These do not breed true from seed, but may be propagated by division. On the motion of Mr. Fawcett, seconded by Mr. Hanbury, a Certificate of Appreciation was recommended to Mr. Hemsley for his work in raising these new forms.

Saxifraga Cotyledon aberrant.—Sir Arthur Hort sent a piece of *Saxifraga Cotyledon* with young plants growing in the place of flowers in the inflorescence.

Form of Trifolium repens.—Mr. Wood of Ashted showed a few flower heads of *Trifolium repens* with the flowers having long stalks. This malformation has been ascribed to the presence of a grub in the lower part of the plant.

Lactuca sp.—Mr. Fraser showed examples of the British species of *Lactuca* and made remarks upon them.

SCIENTIFIC COMMITTEE, AUGUST 12, 1924.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and eleven other members present.

Brassica arvensis with malformed pod.—Mr. Fraser showed a pod of *Brassica arvensis* much larger than usual and curved, the malformation resulting from the attack of the fungus *Cystopus candidus*.

Sempervivella alba.—Mr. Chittenden showed a specimen of this new plant, which had been introduced under the name *Umbilicus* sp. by Mr. Elwes, and pointed out that variations were apparent in the seedlings.

Disease of Sweet Peas.—Mr. Dowson showed examples of a newly described disease of Sweet Peas, an account of which is published in the JOURNAL, vol. xlix, pt. 2.

SCIENTIFIC COMMITTEE, AUGUST 26, 1924.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and five other members present.

Proliferous and Virescent Plants.—Several examples of proliferous plants (including rose, and *Primula malacoides* with buds on the inflorescence) and of virescent growths (including *Helenium pumilum* and *Scabiosa atropurpurea*) were exhibited.

Growth from Cotyledon.—Col. Evans sent a sketch of the cotyledon of a carnation which had forked and from the axil of the fork produced a shoot bearing normal leaves.

Orchid from China.—A spike of a yellow-flowered orchid from China was received for identification. It is a species of *Spathoglottis*, and Mr. Cotton took it for further examination.

SCIENTIFIC COMMITTEE, SEPTEMBER 9, 1924.

Mr. F. J. HANBURY, F.L.S., V.M.H., in the Chair, and six other members present.

British Plants.—Mr. Marsden Jones exhibited British plants collected near Devizes, including a white form of *Colchicum autumnale*, *Erica ciliaris*, and a white var., and also a plant which was thought to be a hybrid between *E. ciliaris* and *tetralix*, *Hieracium maculatum*, *Cnicus eriophorum*, *C. tuberosus*, and *acaulis*. He also showed a plant which he thought was a cross between the last two, *Centaurea nigra radiata*, *Dianthus plumarius*, and a white-flowered form of *Aster Tripolium*.

Solanum sp.—A sp. of *Solanum* from Greece was taken by Mr. Cotton for identification.

Diseased plants.—Miss E. Thornton, S. Oswald's, Eton Green, Godalming, sent leaves of diseased *Antirrhinum*s and *Phlox*, which were sent to Wisley for examination.

Plants for naming.—Plants of *Gentiana Pneumonanthe* and *Lactuca Plumieri* were sent for name.

SCIENTIFIC COMMITTEE, OCTOBER 7, 1924.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, twelve other members and Messrs. VAN DER WEYER and DENNIS (visitors) present.

Pelargonium sports.—Dr. Bateson showed a *Pelargonium* known as "Kleine-lubcha" from Messrs. Haage & Schmidt, with small pink flowers, white-edged. The root produces buds, the plants from which bear larger flowers which are hermaphrodite (instead of female flowers only as in the parent), and have no white edge to the petals.

Mr. Hales showed a totally albino shoot from a variegated plant. Mr. Bateson remarked that both the green and white sports are fertile.

Wild plants in Westminster.—Mr. Dennis showed *Sisymbrium pannonicum*, a *Reseda*, and *Senecio viscosus* from a derelict site in Westminster.

Composite? for naming.—Mr. Hosking showed a Composite with a (unattached) compound leaf from Mr. Pagswell for naming, which Dr. Rendle took.

Buddleia crosses.—Mr. Van der Weyer showed some second generation seedlings from his crosses of *Buddleia magnifica* and *B. globosa*, showing that some of the seedlings had returned to the form of *B. magnifica*.

British plants.—Mr. Marsden Jones showed *Polygonum Raii* (or *littoralis*), and a hybrid thistle, *Cnicus acaulis* × *C. tuberosus*, verified by Mr. Fraser, who described the differences between the hybrid and its parents.

SCIENTIFIC COMMITTEE, OCTOBER 21, 1924.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and four other members present.

Various plants.—Mr. F. Hanbury showed a malformed *Cypripedium* with lateral petals connate, and a plant which appeared to be a hybrid between *Calendula arvensis* and *C. officinalis*. He also showed *Ruellia Portellae*.

Fruiting plants.—Mr. Preston showed *Jasminum Beesianum* in fruit, and *Laurustinus* (*Viburnum Tinus*) and *Lonicera pileata* also fruiting.

SCIENTIFIC COMMITTEE, NOVEMBER 4, 1924.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and four other members present.

Elder leaf bipinnate.—Mr. J. Fraser showed the leaf of an elder with some leaflets again pinnately compound.

Colletias.—Mr. Hosking showed *Colletia cruciata* and *C. spinosa*. The latter is apparently a species distinct from the former, and while seedlings of *C. spinosa* have the same general appearance, yet in course of a short time some of the spines become flattened as in *C. cruciata*.

Hyacinth chimera.—Miss Coleby showed a drawing of a hyacinth, one side of the spike of which was pink, the other blue—a clean-cut sectional chimera. The bulb was in the garden of Mr. Trower, and is being grown again this year.

SCIENTIFIC COMMITTEE, NOVEMBER 18, 1924.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and eight other members present.

Salix sphacelata.—Mr. Fraser showed specimens and made some remarks upon *Salix sphacelata* of Smith, which was collected on Ben Lawers. *Salix Caprea* Mr. Marshall had collected with leaves quite entire except the upper ones, which were crenate, and this he believed to be the same as *S. sphacelata*. His specimen was growing at an elevation of 1,600 feet, by a streamlet at Meall Garbh, where it grows to the stature of a small tree of six or eight feet.

Colletias.—Mr. Hosking showed some further specimens of *Colletia*, and Mr. Bowles brought some for comparison. Of the former *C. cruciata* flowered every autumn, and is now in flower. It fruited two years ago when no other was in flower and two seedlings were raised. These seedlings were at first like *spinosa*, but were now developing the flattened spikes of *cruciata*. *C. spinosa* had not flowered and seedlings raised from La Mortola seed under that name had proved to be like *C. cruciata*. The plants differ in the amount of pubescence. *C. spinosa* flowers regularly in Mr. Bowles' garden in June and July, and another form somewhat like it in September and October.

SCIENTIFIC COMMITTEE, DECEMBER 2, 1924.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and six other members present.

Potato sport.—Mr. Fraser showed two tubers from the same root of 'Kerr's Pink,' one the normal pink, the other white.

Tuber.—Dr. Voelcker remarked upon the large tuber he showed some time ago, and which had now flowered, proving to be a species of *Dolichos*. Exact identification was deferred on account of absence of foliage.

SCIENTIFIC COMMITTEE, DECEMBER 16, 1924.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and six other members present.

Effect of fog.—Mr. Hales showed specimens of *Eupatorium adenophyllum* with the edges of the leaves burned as though by fire, the result of the recent fogs.

Losses suffered by the Committee.—Reference was made to the losses the Committee had suffered by reason of the death of Mr. Irwin Lynch and of Mr. Botting Hemsley. Both had been members of the Committee for many years, and had often brought interesting and valuable matters before the members.

To Mr. F. G. Wood, for herbaceous and alpine plants.
 To Messrs. G. Gibson, for herbaceous plants.
 To Messrs. Isaac House, for Scabious and Tritomas.
 To Messrs. G. Jackman, for Clematis and herbaceous plants.
 To Messrs. Jones & Ingwersen, for alpine plants and shrubs.
 To Messrs. Maxwell & Beale, for mixed group.
 To Mr. Amos Perry, for Lilies, herbaceous plants, etc.
 To Mr. G. Reuthe, for herbaceous plants and shrubs.

Silver Flora Medal.

To Mr. A. Edwards, for Gladioli.
 To Messrs. Lowe & Gibson, for Gladioli.
 To Mr. T. Carlile, for herbaceous plants.
 To French Intensive Gardens, for ornamental grasses and everlasting flowers.
 To Messrs. Harkness & Sons, for herbaceous plants.
 To Messrs. Godfrey, for herbaceous plants.
 To Messrs. B. Ladhams, for Lobelias, etc.
 To Chalk Hill Nurseries, for herbaceous plants and Poppies.
 To Messrs. Rich, for herbaceous cut flowers.

Silver Banksian Medal.

To Orpington Nurseries Co., for Gladioli.
 To Mr. E. Dixon, for alpine and herbaceous plants.
 To Messrs. J. Forbes, for Phlox and Pentstemons.
 To Messrs. W. H. Rogers, for alpines, alpine shrubs, and perennials.

Bronze Flora Medal.

To Messrs. Reamsbottom, for St. Brigid Anemones.

GENERAL MEETING.

OCTOBER 7, 1924.

Sir WILLIAM LAWRENCE, Bt., in the Chair.

One hundred and fifty Fellows and eleven Associates were elected, and four Societies affiliated.

A Conference was held on New Apples and Pears.

R.H.S. FRUIT AND VEGETABLE SHOWS.

OCTOBER 7 AND 8, 1924.

FRUIT SHOW.

LIST OF JUDGES.

ALLGROVE, J. C.	HARRISS, E.	PATEMAN, T.
BARNES, N. F., V.M.H.	HOWE, W.	PEARSON, A. H., V.M.H.
BASHAM, J.	JORDAN, F.	PRINCE, H.
BATES, W.	KELF, G.	RIVERS, H. S.
BULLOCK, A.	LAXTON, E. A. L.	SMITH, A. C.
CHEAL, J., V.M.H.	MCLEOD, J. F.	VEITCH, P. C. M., V.M.H.
COBB, A. J.	MARKHAM, E.	VERT, J.
CRUMP, W., V.M.H.	MARKHAM, H.	WESTON, J. G.
DIVERS, W. H., V.M.H.	METCALFE, A. W.	WILSON, J.
FIELDER, C. R., V.M.H.	NEAL, E.	WOODWARD, G.

Chief Awards.

Class 1.—Amateurs. Collection of ripe dessert fruits.

First Prize.

To Capt. M. Drummond (gr. Mr. L. Smith).

Class 14.—Trade. Collection of hardy fruits.

Gold Medal.

To Mr. J. C. Allgrove.

Class 16.—Market Growers. 12 British standard boxes of Apples.

Gold Medal.

To Hollesley Bay Colony.

Affiliated Societies Challenge Cup, for Apples and Pears.

To North Walsham and District Horticultural Society.

George Munro Memorial Cup, for the best exhibit of Grapes by an Amateur.

To Sir William Lawrence, Bt. (gr. Mr. J. Brown).

Gordon-Lennox Cup, for the most meritorious display of Fruit by an Amateur.

To Sir Charles Nall-Cain (gr. Mr. T. Pateman).

VEGETABLE SHOW.

LIST OF JUDGES.

BECKETT, E., V.M.H.
GIBSON, J.
GILES, W. F.
IRELAND, A.

JANES, E. R.
LOBJOIT, W. J.
MESSENGER, W.
MIDDLETON, C. H.

POUPART, J.
PRITCHARD, W. J.
STEWART, W.
VINE, J. E.

Chief Awards.

Class 1.—Amateurs. Collection of vegetables.

First Prize, Sutton Cup.

To Major A. Pam (gr. Mr. F. Streeter).

R.H.S. Challenge Cup, for highest number of points gained at the Show.

To Mrs. Jenner (gr. Mr. H. Wheeler), 22 points.

GENERAL MEETING.

OCTOBER 21, 1924.

The Hon. H. D. MACLAREN in the Chair.

Sixty Fellows and twenty Associates were elected, and one Society affiliated.

A lecture was given by Dr. A. W. Hill, Sc.D., F.R.S., on "The Imperial College of Tropical Agriculture, Trinidad."

ORCHID SHOW AWARDS.

Large Silver Cup.

To Lt.-Col. Sir George Holford (gr. Mr. H. G. Alexander).

Small Silver Cup.

To Mr. J. J. Joicey.

Gold Medal.

To Messrs. Sanders.

To Messrs. J. & A. McBean.

Silver-gilt Lindley Medal.

To Lt.-Col. Sir George Holford.

Silver-gilt Banksian Medal.

To Messrs. S. Low.

To Mr. H. T. Pitt (gr. Mr. Thurgood).

To Sir Jeremiah Colman, Bt., V.M.H. (gr. Mr. J. Collier).

To Messrs. Cowan.

lxxvi PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

Silver Banksian Medal.

To Messrs. Cypher.

To Mr. H. Dixon.

Bronze Banksian Medal.

To Mr. L. Dixon.

Special Vote of Thanks.

To Messrs. Armstrong & Brown.

IMPERIAL FRUIT SHOW, BIRMINGHAM.

OCTOBER 24, 1924.

Gold Medal.

Class 18.—Messrs. B. Bomford, for Pears.

Class 19.—Mr. G. D. Laurens, for Pears.

GENERAL MEETING.

NOVEMBER 4, 1924.

Mr. C. G. A. Nix, V.M.H., in the Chair.

Fifty-seven Fellows and one Associate were elected, and one Society affiliated.

A lecture was given by Mr. D. Cuthbertson on "The Relation of Leaf and other Diseases of the Potato to the Crop." (See p. 21.)

GENERAL MEETING.

NOVEMBER 18, 1924.

The Rt. Hon. The Lord LAMBOURNE, P.C., V.M.H., in the Chair.

Seventy-six Fellows and one Associate were elected.

A lecture was given by Mr. A. L. Wettern on "The Rose Trial Garden at Wisley."

GENERAL MEETING.

DECEMBER 2, 1924.

Dr. A. B. RENDLE, F.R.S., V.M.H., in the Chair.

Twenty-nine Fellows were elected, and four Societies affiliated.

A lecture was given by Miss Saunders on "Some Conceptions of the Leaf-Member, Old and New" (p. 241).

GENERAL MEETING.

DECEMBER 16, 1924.

The Rt. Hon. The Lord LAMBOURNE, P.C., V.M.H., in the Chair.

Forty-three Fellows and one Associate were elected, and two Societies affiliated.

SCIENTIFIC COMMITTEE.

JULY 8, 1924.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, ten other members and Mr. M. B. CRANE (visitor) present.

Gall on Rhododendron ferrugineum.—Mr. Cory sent from Duffryn foliage of *Rhododendron ferrugineum* attacked by the fungus *Exobasidium Rhododendri*, forming reddish galls upon the leaves.

Tuber growing.—Dr. Voelcker showed again a large tuber which was at first thought to be a Dioscorea, but which proved to be a leguminous plant now flowering, after being dry for two years (see p. lxxix).

Pollination of Cherries.—Mr. C. H. Hooper showed charts to illustrate the order of flowering of cherries, and the self-fertile and self-sterile varieties. The importance of correct nomenclature in any recommendations that might be made was commented upon.

Habenaria aberrant.—Mr. Fraser made some remarks upon the aberrant *Habenaria*, which Mr. P. Bunyard showed at a recent meeting from plants which he had exhibited last year. He found it had four additional anthers.

Galls on Willow.—Mr. Fraser also showed galls on *Salix undulata*, due to the attack of *Eriophyes triradiatus*.

Various plants.—Mr. Arkwright showed *Geranium pratense* var. *striatum*; a *Viola* which does not seed; *Jasminum officinale* grafted upon *J. nudiflorum*; a number of kinds of hybrid origin of various colours except cream. Mr. Hosking showed *Allium* sp., *Silene* sp., *Camelina sativa*, *Caucalis*, *Asperula setosa*, *Anthemis tinctoria*, *Bromus* sp., *Romeria* hybrids, *Glaucium phoeniceum*, *Papaver Rhoeas*, *P. hybridum*, *Sisymbrium pannonicum*.

Fasciated Sempervivum.—Mr. Preston showed a fasciated *Sempervivum*, with a flattened fan-shaped stem, nine or ten inches in diameter. He also showed fruiting specimens of *Nuttallia cerasiformis*.

Plants from the Mediterranean district.—Mr. Bowles showed a number of plants in flower which he had collected in Algeria, including *Echium pomponium*, *E. calycinum*, *Cynoglossum cheirifolium*, *Biarum tenuifolium*.

SCIENTIFIC COMMITTEE, JULY 22, 1924.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and fourteen other members present.

Digitalis.—Mr. A. Hosking showed a pale yellow form of *Digitalis purpurea* called 'Primrose Queen,' *D. lutea*, and a hybrid between *D. lutea* and *D. purpurea*, *D. Buxbaumii* which was like the last, Ryders' hybrids of which *D. ambigua* appears to be a parent, *D. lanata*, *D. ferruginea gigantea*, and another species with fuscous flowers.

Sidalceas.—Mr. Hemsley of Crawley showed a series of seedling *Sidalceas*, hybrids of *malvaeflora* and *Listeri*, showing several uncommon shades. These do not breed true from seed, but may be propagated by division. On the motion of Mr. Fawcett, seconded by Mr. Hanbury, a Certificate of Appreciation was recommended to Mr. Hemsley for his work in raising these new forms.

Saxifraga Cotyledon aberrant.—Sir Arthur Hort sent a piece of *Saxifraga Cotyledon* with young plants growing in the place of flowers in the inflorescence.

Form of Trifolium repens.—Mr. Wood of Ashted showed a few flower heads of *Trifolium repens* with the flowers having long stalks. This malformation has been ascribed to the presence of a grub in the lower part of the plant.

Lactuca sp.—Mr. Fraser showed examples of the British species of *Lactuca* and made remarks upon them.

SCIENTIFIC COMMITTEE, AUGUST 12, 1924.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and eleven other members present.

Brassica arvensis with malformed pod.—Mr. Fraser showed a pod of *Brassica arvensis* much larger than usual and curved, the malformation resulting from the attack of the fungus *Cystopus candidus*.

Sempervivella alba.—Mr. Chittenden showed a specimen of this new plant, which had been introduced under the name *Umbilicus* sp. by Mr. Elwes, and pointed out that variations were apparent in the seedlings.

Disease of Sweet Peas.—Mr. Dowson showed examples of a newly described disease of Sweet Peas, an account of which is published in the JOURNAL, vol. xlix, pt. 2.

SCIENTIFIC COMMITTEE, AUGUST 26, 1924.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and five other members present.

Proliferous and Virescent Plants.—Several examples of proliferous plants (including rose, and *Primula malacoides* with buds on the inflorescence) and of virescent growths (including *Helenium pumilum* and *Scabiosa atropurpurea*) were exhibited.

Growth from Cotyledon.—Col. Evans sent a sketch of the cotyledon of a carnation which had forked and from the axil of the fork produced a shoot bearing normal leaves.

Orchid from China.—A spike of a yellow-flowered orchid from China was received for identification. It is a species of *Spathoglottis*, and Mr. Cotton took it for further examination.

SCIENTIFIC COMMITTEE, SEPTEMBER 9, 1924.

Mr. F. J. HANBURY, F.L.S., V.M.H., in the Chair, and six other members present.

British Plants.—Mr. Marsden Jones exhibited British plants collected near Devizes, including a white form of *Colchicum autumnale*, *Erica ciliaris*, and a white var., and also a plant which was thought to be a hybrid between *E. ciliaris* and *tetralix*, *Hieracium maculatum*, *Cnicus eriophorum*, *C. tuberosus*, and *acaulis*. He also showed a plant which he thought was a cross between the last two, *Centaurea nigra radiata*, *Dianthus plumarius*, and a white-flowered form of *Aster Tripolium*.

Solanum sp.—A sp. of *Solanum* from Greece was taken by Mr. Cotton for identification.

Diseased plants.—Miss E. Thornton, S. Oswald's, Enton Green, Godalming, sent leaves of diseased *Antirrhinum*s and *Phlox*, which were sent to Wisley for examination.

Plants for naming.—Plants of *Gentiana Pneumonanthe* and *Lactuca Plumieri* were sent for name.

SCIENTIFIC COMMITTEE, OCTOBER 7, 1924.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, twelve other members and MESSRS. VAN DER WEYER and DENNIS (visitors) present.

Pelargonium sports.—Dr. Bateson showed a *Pelargonium* known as "Kleinelubcha" from Messrs. Haage & Schmidt, with small pink flowers, white-edged. The root produces buds, the plants from which bear larger flowers which are hermaphrodite (instead of female flowers only as in the parent), and have no white edge to the petals.

Mr. Hales showed a totally albino shoot from a variegated plant. Mr. Bateson remarked that both the green and white sports are fertile.

Wild plants in Westminster.—Mr. Dennis showed *Sisymbrium pannonicum*, a *Reseda*, and *Senecio viscosus* from a derelict site in Westminster.

Composite? for naming.—Mr. Hosking showed a Composite with a (unattached) compound leaf from Mr. Pagswell for naming, which Dr. Rendle took.

Buddleia crosses.—Mr. Van der Weyer showed some second generation seedlings from his crosses of *Buddleia magnifica* and *B. globosa*, showing that some of the seedlings had returned to the form of *B. magnifica*.

British plants.—Mr. Marsden Jones showed *Polygonum Raii* (or *littoralis*), and a hybrid thistle, *Cnicus acaulis* × *C. tuberosus*, verified by Mr. Fraser, who described the differences between the hybrid and its parents.

SCIENTIFIC COMMITTEE, OCTOBER 21, 1924.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and four other members present.

Various plants.—Mr. F. Hanbury showed a malformed *Cypripedium* with lateral petals connate, and a plant which appeared to be a hybrid between *Calendula arvensis* and *C. officinalis*. He also showed *Ruellia Portellae*.

Fruiting plants.—Mr. Preston showed *Jasminum Beesianum* in fruit, and *Laurustinus* (*Viburnum Tinus*) and *Lonicera pileata* also fruiting.

SCIENTIFIC COMMITTEE, NOVEMBER 4, 1924.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and four other members present.

Elder leaf bipinnate.—Mr. J. Fraser showed the leaf of an elder with some leaflets again pinnately compound.

Colletias.—Mr. Hosking showed *Colletia cruciata* and *C. spinosa*. The latter is apparently a species distinct from the former, and while seedlings of *C. spinosa* have the same general appearance, yet in course of a short time some of the spines become flattened as in *C. cruciata*.

Hyacinth chimera.—Miss Coleby showed a drawing of a hyacinth, one side of the spike of which was pink, the other blue—a clean-cut sectional chimera. The bulb was in the garden of Mr. Trower, and is being grown again this year.

SCIENTIFIC COMMITTEE, NOVEMBER 18, 1924.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and eight other members present.

Salix sphacelata.—Mr. Fraser showed specimens and made some remarks upon *Salix sphacelata* of Smith, which was collected on Ben Lawers. *Salix Caprea* Mr. Marshall had collected with leaves quite entire except the upper ones, which were crenate, and this he believed to be the same as *S. sphacelata*. His specimen was growing at an elevation of 1,600 feet, by a streamlet at Meall Garbh, where it grows to the stature of a small tree of six or eight feet.

Colletias.—Mr. Hosking showed some further specimens of *Colletia*, and Mr. Bowles brought some for comparison. Of the former *C. cruciata* flowered every autumn, and is now in flower. It fruited two years ago when no other was in flower and two seedlings were raised. These seedlings were at first like *spinosa*, but were now developing the flattened spikes of *cruciata*. *C. spinosa* had not flowered and seedlings raised from La Mortola seed under that name had proved to be like *C. cruciata*. The plants differ in the amount of pubescence. *C. spinosa* flowers regularly in Mr. Bowles' garden in June and July, and another form somewhat like it in September and October.

SCIENTIFIC COMMITTEE, DECEMBER 2, 1924.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and six other members present.

Potato sport.—Mr. Fraser showed two tubers from the same root of 'Kerr's Pink,' one the normal pink, the other white.

Tuber.—Dr. Voelcker remarked upon the large tuber he showed some time ago, and which had now flowered, proving to be a species of *Dolichos*. Exact identification was deferred on account of absence of foliage.

SCIENTIFIC COMMITTEE, DECEMBER 16, 1924.

Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and six other members present.

Effect of fog.—Mr. Hales showed specimens of *Eupatorium adenophyllum* with the edges of the leaves burned as though by fire, the result of the recent fogs.

Losses suffered by the Committee.—Reference was made to the losses the Committee had suffered by reason of the death of Mr. Irwin Lynch and of Mr. Botting Hemsley. Both had been members of the Committee for many years, and had often brought interesting and valuable matters before the members.

FRUIT AND VEGETABLE COMMITTEE.

JULY 8, 1924.

Mr. C. G. A. Nix, V.M.H., in the Chair, and fourteen other members present.

Awards Recommended :—

Silver Hogg Medal.

To Messrs. Laxton, Bedford, for Strawberries.

Silver Hogg Medal and Cultural Commendation.

To Lionel de Rothschild, Esq., Gunnersbury Park, Acton (gr. Mr. Reynolds), for Melon 'Gunnersbury Park.'

Silver Bunyard Medal.

To Sir Chas. Nall-Cain, Bt. (gr. Mr. Pateman), Hatfield, for Cherries.

Other Exhibits.

Mr. G. W. Colenutt, Ryde: 'Hanway Berry' (recommended for trial at Wisley).

The recommendations made by the Sub-Committee visiting Wisley to judge the trial of Early Strawberries were confirmed.

FRUIT AND VEGETABLE COMMITTEE, JULY 22, 1924.

Mr. E. A. BUNYARD, F.L.S., in the Chair, and sixteen other members present.

Awards Recommended :—

Silver Bunyard Medal.

To J. A. Nix, Esq. (gr. Mr. Neal), Crawley, for Gooseberries.

To Mr. H. Kramb, Southfields, for Gooseberries.

Bronze Bunyard Medal.

To Sir Chas. Nall-Cain, Bt. (gr. Mr. Pateman), Hatfield, for Gooseberries.

Other Exhibits.

Messrs. Laxton, Bedford: Black Currants and Gooseberries.

Messrs. Bunyard, Maidstone: Cherries, Currants and Gooseberries.

Messrs. Chivers, Histon: Black Currants and Raspberries.

Messrs. Lynn, Emneth: Raspberry 'Superb' (recommended to be sent to Wisley for trial).

Messrs. Sale, Wokingham: Seedling Cherry.

Mrs. Holland, Exmouth: Gooseberries.

Mr. C. H. Edwards, Bridge, Redruth: Gooseberries.

Mrs. Meres, Torquay: Gooseberries.

Mr. G. Jackson, Chessington: Gooseberries.

Mr. W. G. Richards, Arlington: Gooseberries.

Mr. J. W. H. Robb, Wisbech: Gooseberries.

Mr. F. J. Norman, Swavesey: Gooseberries.

Maj. the Hon. E. H. Wyndham, M.C., Bicester: Melon 'Althorpe' (recommended for trial at Wisley).

R.H.S. Gardens, Wisley: Collection of Gooseberries.

The recommendations made by the Sub-Committees visiting Wisley to judge the trials of Currants and Lettuces were confirmed.

WISLEY TRIALS, JULY 17, 1924.

The following awards have been made to Currants by the Council of the Royal Horticultural Society, after trial at Wisley:

Award of Merit.

9. 'Florence' (Black), sent by Sir Charles Nall-Cain, Brockett Hall (gr. Mr. Pateman).

11. 'Invincible,' Giant Prolific (Black), sent by Messrs. Storrie & Storrie, Glencarse, Perthshire.
 19. 'Big Red Dutch' (Red), sent by Messrs. B. Ruys, Dedemsvaart, Holland.

Highly Commended.

8. 'Orr's Seedling' (Black), sent by Mr. Wm. Orr, Carnforth.
 18. 'Long Bunch White' sent by Messrs. B. Ruys, Dedemsvaart, Holland.

WISLEY TRIALS, 1924.

The awards made to Cos Lettuce (Spring sown), by the Council of the Royal Horticultural Society, after trial at Wisley, are shown in the report on Lettuces at Wisley.

WISLEY TRIALS, 1924.

The following awards have been made to Early Strawberries by the Council of the Royal Horticultural Society, after trial at Wisley :

FOR CROPPING AND QUALITY.

Award of Merit.

- 'King George,' sent by Mr. W. G. Holmes, Tain.

FOR CROPPING.

Highly Commended.

- 'The Duke,' sent by Mr. R. Reed, Wisbech.

FOR EARLINESS AND CROPPING.

- 'Early Even' = 'Rufus' of Miller of Wisbech = 'Tuckswood Early' of Holmes, and raised on Continent as 'Deutsch Even.' From Holland.

FOR EARLY PRESERVING.

- 'Boreal Giant,' sent by Mr. Robt. Holmes, Norwich.

FOR FLAVOUR.

Commended.

- 'Sir Douglas Haig,' sent by Messrs. Laxton, Bedford.
 'Invicta,' sent by Mr. F. B. Longley, Hythe.

FOR CROPPING.

- 'Dessert,' sent by Messrs. Laxton, Bedford.

FOR EARLINESS AND CROPPING.

- 'John Ruskin,' sent by Mr. R. Johnstone, Annan.

FRUIT AND VEGETABLE COMMITTEE, AUGUST 12, 1924.

Mr. J. CHEAL, V.M.H., in the Chair, and twelve other members present.

Award Recommended :—*Silver Bunyard Medal.*

To A. T. Goodwin, Esq., Maidstone, for Peaches.

Other Exhibits.

Messrs. Bunyard, Maidstone : Plums, Gooseberries and Apples in season.
 Messrs. Daniels, Norwich : Currant 'September Black,' and Apples.
 G. R. Burness, Esq., Faversham : Peaches.
 Mr. F. Woollard, Brighton : 'Pelham Berry.'
 Mr. R. T. Burrell, Bury St. Edmunds : Myrobalan Plum.

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Mrs. R. G. Leathart, Morpeth : Pea for identification.

Mr. E. A. Bunyard, Maidstone : Flat Peach of China, 'Peen-To.'

The recommendations made by the Sub-Committee visiting Wisley to judge the trial of Dwarf French Beans were confirmed.

WISLEY TRIALS, JULY 29, 1924.

The following awards have been made to Dwarf French Beans by the Council of the Royal Horticultural Society, after trial at Wisley :

WAXPOD VARIETIES.

Award of Merit.

1. 'King of the Wax,' sent by Messrs. Carter, Raynes Park.
20. 'Perfection,' sent by Messrs. Barr, London.

Highly Commended.

10. 'Melting Wax,' sent by Messrs. Carter, Raynes Park.
12. 'Yellow Gem,' sent by Messrs. Barr, London.
15. 'Wax Date,' sent by Messrs. L. Daehnfeldt, Ltd., Odense, Denmark.

Commended.

7. 'Wax Flageolet,' sent by Messrs. L. Daehnfeldt, Ltd., Odense, Denmark.
13. 'Haricot nain Beurre cent pour un,' sent by Messrs. Rivoire, Père et Fils, Lyon.

TOUGH GREEN PODDED VARIETIES.

Award of Merit.

- | | |
|-------------|---|
| | 31. 'Ne Plus Ultra' (selected), sent by Messrs. G. Cooling, Bath. |
| | 43. 'Mogul,' sent by Messrs. Chas. Elliott, Park Ridge, Ill., U.S.A. |
| | 54. 'Masterpiece,' sent by Messrs. Dobbie, Edinburgh. |
| | 55. 'Longwood' (reselected), sent by Messrs. Carter, Raynes Park. |
| | 56. 'Nosuch,' sent by Messrs. Watkins & Simpson. |
| | 57. 'XL All,' sent by Messrs. F. Dicks, Manchester. |
| Much alike. | 58. 'Reliance,' sent by Messrs. Sutton, Reading. |
| | 59. 'Dwarf Fillbasket,' sent by Messrs. Barr, London. |
| | 60. 'Bountiful,' sent by Messrs. Webb, Stourbridge. |
| | 63. 'St. Andrews,' sent by Messrs. Heinemann, Erfurt. |
| | 64. 'English Wonder,' sent by Messrs. Clibrans, Altrincham. |
| | 65. 'Excelsior,' sent by Messrs. Barr, London. |
| | 67. 'Bounteous,' sent by Messrs. Watkins & Simpson, London. |
| *Alike. | 69, 70. 'Perpetual,' sent by Messrs. Barr, London, and Messrs. Carter, Raynes Park. |
| | 71. 'Evergreen,' sent by Messrs. Sutton, Reading. |
| | 81. 'Mastodon,' sent by Messrs. Chas. Elliott, Park Ridge, Ill., U.S.A. |
| | 83. 'Superlative,' sent by Messrs. T. Cullen, Witham. |
| Alike. | 84, 85. 'Maggie,' sent by Messrs. Carter, Raynes Park, and Messrs. Harrison, Leicester. |
| | 96. 'The Wonder,' sent by Messrs. Watkins & Simpson, London. |
| | 122. 'Canadian Wonder,' sent by Messrs. A. Dickson, Belfast. |
| | 123. 'Canadian Wonder,' sent by Messrs. Dobbie, London. |
| | 124. 'Canadian Wonder,' (selected), sent by Messrs. Carter, Raynes Park. |
| Alike. | 125. 'Canadian Wonder,' Improved, sent by Messrs. W. H. Simpson, Birmingham. |
| | 126. 'Canadian Wonder,' sent by Messrs. Nutting, London. |
| | 133. 'Canadian Wonder, Express,' sent by Messrs. Carter, Raynes Park. |

Highly Commended.

- | | |
|-------------|---|
| | 28. 'Haricot nain de St. Germain,' sent by Messrs. Rivoire, Lyon. |
| Alike. | 118. 'Chevrier Vert,' sent by Messrs. Carter, Raynes Park. |
| | 119. 'Chevrier Green,' sent by Messrs. A. Dickson, Belfast. |
| Much alike. | 148-152. 'Earliest of All,' sent by Messrs. W. H. Simpson, Nutting, Cullen, A. Dickson, and Dobbie. |
| | 153. 'Cluster,' sent by Messrs. Webb, Stourbridge. |

Commended.

- Alike and with No. 31. { 32. 'Ne Plus Ultra,' sent by Messrs. Cooper-Taber, London.
 33. 'Ne Plus Ultra,' sent by Messrs. Watkins & Simpson.
 34. 'Ne Plus Ultra,' sent by Messrs. Dobbie, Edinburgh.
 35. 'Ne Plus Ultra,' sent by Messrs. Carter, London.
 36. 'Ne Plus Ultra,' sent as 'Incomparable' by Messrs. Kelway, Langport.
 37. 'Harbinger,' sent by Messrs. Webb, Stourbridge.
 72. 'Thanet Giant,' sent by Messrs. Watkins & Simpson.
 *154. 'Fifty Days,' sent by Messrs. Carter, Raynes Park.

First-Class Certificate.

48. 'Masterpiece Improved,' sent by Messrs. Chas. Elliott, Park Ridge, Ill., U.S.A.

FRUIT AND VEGETABLE COMMITTEE, AUGUST 26, 1924.

Mr. J. CHEAL, V.M.H., in the Chair, and sixteen other members present.

Awards Recommended:—*Gold Medal.*

To J. A. Nix, Esq. (gr. Mr. E. Neal), Tilgate, Crawley, for collection of fruit.
 To Messrs. Bunyard, Maidstone, for Plums.

Bronze Bunyard Medal.

To Mr. W. R. Scott, Bunney Park Gardens, Notts, for Plums.

Other Exhibits.

Messrs. Daniels, Norwich: Apples and Black Currants.
 Mrs. McDowell Nathan, Potters Bar: Blackberries.
 Mr. J. Royce, Danbury: Apple 'Redgate Seedling.'
 Mr. F. B. Rogers, Hornsey: seedling Apple.
 Mr. H. R. Taylor, Cheam: seedling Apples.
 Mr. J. H. Young, Witham: Apple for opinion.
 H. E. Jolly, Esq., Kildare: Gooseberry seedlings.
 Mr. F. J. Wood, Ashted: Tomato 'Ashted Ropes.'
 Mr. A. Barden, Groombridge: seedling Apple.

The following recommendations made by the Sub-Committee visiting Wisley to judge the trial of Early Potatos were confirmed:—

FIRST EARLY POTATOS.

Award of Merit.

- | | | |
|---------|--------------------------|---|
| { 5, 6. | Duke of York,
sent as | sent by Messrs. Daniels Bros., Norwich, and by
Garden Supplies, Ltd. |
| { 8. | O.K. Seedling
and | " " " Garden Supplies, Ltd. |
| { 9. | Midlothian Early | " " " Dobbie, Edinburgh. |
| { 11. | Immune Ashleaf † | " " " " " " |
| { 12. | " " " | " " " W. H. Simpson, Birmingham. |
| { 16. | Sharpe's Express | " " " Dobbie. |
| { 17. | " " " | " " " Garden Supplies, Ltd. |
| { 18. | " " " | " " " W. H. Simpson. |

Highly Commended.

21. Dargill Early * " " " Garden Supplies, Ltd.

Commended.

32. Early Pink Champion* " " " Mr. A. D. Findlay, Auchtermuchty, Fife.

* Recommended for earliness, pods borne in one crop.

† Immune.

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FRUIT AND VEGETABLE COMMITTEE, SEPTEMBER 9, 1924.

Mr. C. G. A. NIX, V.M.H., in the Chair, and seventeen other members present.

Award Recommended :—

Silver Hogg Medal.

To Mrs. Reed, Devizes (gr. Mr. E. Thayer), for collection of Grapes.

Other Exhibits.

J. Davis, Esq., Bromham : seedling Potatoes 'Melody' and 'Chorister' ; it was recommended that these be sent to Ormskirk for testing against Wart disease.

Lionel de Rothschild, Esq. (gr. Mr. Geo. Reynolds), Gunnersbury Park, Acton : Grape 'Cote House Seedling.' A deputation was instructed to inspect the vine and report on cropping capacity, vigour, etc.

Messrs. Daniels, Norwich : Apples, Pears, and Currants.

Messrs. Laxton, Bedford : Apples 'Imperial,' 'Marlboro,' 'Radiance,' 'Lord Beatty,' 'Beauty of Bedford,' 'Owen Thomas,' and the Pear 'Vanguard.'

Mr. T. Lansdell, Bournemouth : seedling Apples.

FRUIT AND VEGETABLE COMMITTEE, SEPTEMBER 23, 1924.

AT HOLLAND PARK.

Mr. H. S. RIVERS in the Chair, and seventeen other members present.

Awards Recommended :—

Award of Merit.

To Grape 'Cote House Seedling,' sent by Lionel de Rothschild, Esq. (gr. Mr. Geo. Reynolds), Gunnersbury Park, Acton. This is a white grape, the bunches being much the same size and shape as 'Black Hamburg.' The berries are round and well flavoured. The variety grows and fruits well without fire heat and is as easily cultivated as the 'Black Hamburg.' It was obtained by crossing 'Black Hamburg' and 'Muscat of Alexandria.'

Cultural Commendation.

To Mr. H. Hollis, Manresa House Gardens, Roehampton, for 'Black Hamburg' Grapes. The Grapes exhibited came from a vine probably over a hundred years old.

Other Exhibit.

Mr. H. Penfold, Warminster : seedling Apple.

FRUIT AND VEGETABLE COMMITTEE, OCTOBER 7, 1924.

AUTUMN FRUIT SHOW.

Mr. J. CHEAL, V.M.H., in the Chair, and twenty-nine other members present.

Awards Recommended :—

Cultural Commendation.

To A. T. Goodwin, Esq., Maidstone, for Peaches.

Apple 'Bushey Grove,' from Mr. J. T. Good, Bushey, was recommended for inclusion in the Commercial Fruit Trials at Wisley.

Other Exhibits.

Messrs. Laxton, Bedford : Apples 'Laxton's Epicure,' 'Royalty,' 'Laxton's Pearmain,' 'Bountiful,' 'Superb,' 'Lord Lambourne,' 'British Queen,' 'The Prince.'

Mr. A. Marcham, Borough Green, Kent : seedling Peach ; Marrow 'Bush White,' and Turnip 'Green Round' (weight 14 pounds).

Mr. H. Barton, Woodbridge : seedling Apples.
 Mr. W. Honeysett, Hadleigh : seedling Apples.
 Mr. B. A. Barrett, Thames Ditton : Apple for opinion.
 Mr. W. Ingall, Grimoldsby : seedling Apples.
 Mr. M. Nicholls, Kemsing : Raspberry 'St. Regis.'
 Mrs. D. Lewis, Stoke-under-Ham : seedling Apple.
 Messrs. Daniels, Norwich : Apples and Pears.
 Messrs. J. Waterer, Sons & Crisp, Twyford : Apple 'John Waterer.'
 Mr. E. J. Parsons, Worcester : Apples and Berries.
 Mr. J. C. Allgrove, Langley : Apples, Pears, and Plums ; and Pear 'Sir Harry Veitch.'
 Mr. G. Trinder, Fleet : Raspberry 'Golden Hornet.'
 Mr. H. Jones, Letchworth : Apple 'Smiling Morn.'

FRUIT AND VEGETABLE COMMITTEE, OCTOBER 21, 1924.

Mr. C. G. A. NIX, V.M.H., in the Chair, and twelve other members present.

Awards Recommended :—*Gold Medal.*

To Mr. J. C. Allgrove, Langley, for collection of fruit.
 To Messrs. Sutton, Reading, for collection of vegetables.

Silver-gilt Hogg Medal.

To Messrs. Bunyard, Maidstone, for Apples and Pears.

A crimson 'sport' of the Apple 'Newton Wonder,' sent by Mr. C. J. Dicker, Hitchin, was recommended for inclusion in the Commercial Fruit Trials at Wisley.

Other Exhibits.

Chalk Hill Nurseries, Reading : Apples and Pears.
 Mr. J. L. Walker, Fordham : seedling Apple.
 Mr. J. Mattender, Doncaster : Apple 'Mattender's, Aromatic.'
 Mr. T. Barnes, Colchester : seedling Potato (it was recommended that this be sent to Ormskirk for tests against Wart disease).
 Mr. C. S. Goss, Aylesbury : Apple 'Ham Green Favourite.'
 Sir Chas. Nall-Cain, Bt. (gr. Mr. Pateman), Hatfield : Raspberry 'Heytor.'
 Messrs. Isaac House, Bristol : Raspberry 'Heytor.'
 Lord Teignmouth, R.N., Clevedon : seedling Apple.
 Mr. G. Trinder, Fleet : Raspberry 'Golden Hornet.'
 Mr. M. Nicholls, Kemsing : Raspberry 'St. Regis.'

FRUIT AND VEGETABLE COMMITTEE, NOVEMBER 4, 1924.

Mr. C. G. A. NIX, V.M.H., in the Chair, and twelve other members present.

Awards Recommended :—*Gold Medal.*

To Sir Chas. Nall-Cain, Bt. (gr. Mr. Pateman), Brockett Hall, Hatfield, for collection of fruit.
 To Messrs. Dobbie, Edinburgh, for collection of Potatoes.

Silver-gilt Knightian Medal.

To Messrs. Barr, Taplow, for collection of vegetables.

Apple 'Marston Scarlet Wonder,' a crimson form of 'Newton Wonder,' sent by Messrs. Hughes, Marston, was recommended for inclusion in the Commercial Fruit Trials at Wisley.

Other Exhibits.

W. H. Divers, Esq., Hook : Apple 'Col. Yates.'
 J. Cliff, Esq., Cheltenham : seedling Apple.

FRUIT AND VEGETABLE COMMITTEE, NOVEMBER 18, 1924.

Mr. J. CHEAL, V.M.H., in the Chair, and fourteen members present.

Awards Recommended :—

Silver-gilt Knightian Medal.

To Messrs. Carter, Raynes Park, for Potatos.

Silver Knightian Medal.

To Messrs. Sutton, Reading, for collection of Kale.

Apple 'Barnack Orange,' sent by Mr. W. H. Divers, Hook, was recommended for inclusion in the Commercial Fruit Trials at Wisley.

Other Exhibits.

Messrs. Bunyard, Maidstone : collection of Apples in season.

Mr. G. Hills, Ash : seedling Apples.

The following recommendations made by the Sub-Committee visiting Wisley to judge the trial of Endives were confirmed :—

ENDIVES.

Award of Merit.

- | | | | | |
|-----|-----------------------|---|-----|----------------------------|
| 22. | Green Curled Winter | . | . | sent by Messrs. R. Veitch. |
| 23. | Summer Curled | . | " " | R. Veitch. |
| 32. | Early Parisian Summer | . | " " | Barr. |

Highly Commended.

- | | | | | | |
|---|---------|-----------------------------|---|-----|------------------------|
| { | 3. | Broad-leaved Batavian | . | " " | W. A. Burpee. |
| | 6. | Batavian Green | . | " " | Nutting. |
| | 7. | Batavian Hardy Green Winter | . | " " | Barr. |
| { | 14. | Queen of the Winter | . | " " | Barr. |
| | 27. | Emerald Gem | . | " " | Webb. |
| | 16. | Staghorn | . | " " | Barr. |
| | 24. | Ruffec | . | " " | T. Cullen. |
| | 28. | Olivet Curled | . | " " | Barr. |
| { | 30. | Longstanding | . | " " | R. Veitch. |
| | 31. | Longstanding Carmes | . | " " | Barr. |
| | 42. | Whiteheart | . | " " | Webb. |
| | 45, 47. | White Curled | . | " " | W. A. Burpee, Nutting. |

Commended.

- | | | | | |
|-----|-------------------|---|-----|-------|
| 29. | Pancalier | . | " " | Barr. |
| 37. | Louviers | . | " " | Barr. |
| 33. | Paris Market | . | " " | Barr. |
| 35. | Fine Green Curled | . | " " | Webb. |

FRUIT AND VEGETABLE COMMITTEE, DECEMBER 2, 1924.

Mr. C. G. A. NIX, V.M.H., in the Chair, and nine other members present.

Awards Recommended :—

Gold Medal.

To Mr. H. Barton, Woodbridge, for packed fruit.

Silver Hogg Medal.

To the Hon. Vicary Gibbs, Aldenham (gr. Mr. E. Beckett), for collection of Grapes.

Bronze Hogg Medal.

To Mr. H. Hemsley, Crawley, for collection of Apples.

Other Exhibits.

Messrs. Bunyard, Maidstone : collection of Apples in season.
Mr. H. Barton, Woodbridge : Apples for opinion.
Rev. Runnel Moss, Rugby : Apple ' Stretton's Seedling.'
Pickering Cottage Preserves, Maidstone : Preserves.
Mrs. Miller, Marlow : Preserves.

FRUIT AND VEGETABLE COMMITTEE, DECEMBER 16, 1924.

Mr. C. G. A. Nix, V.M.H., in the Chair, and eleven other members present.

Awards Recommended :—

Silver-gilt Hogg Medal.

To Messrs. Bunyard, Maidstone, for collection of Pears.

Cultural Commendation.

To Mr. A. Metcalf, Luton Hoo Gardens, for Persimmon fruits grown in the open at Stamford, Lincs.

Other Exhibits.

Mr. H. Jones, Letchworth : Apple ' Smiling Morn.'
Mr. E. Whitley Strong, Ross-on-Wye : Brussels Sprouts.
Pickering Cottage Preserves, Maidstone : Preserves.
Mrs. Miller, Marlow : Preserves.
Miss H. C. Sewell, South Kensington : Preserves.
Messrs. Westmacott, Charing Cross : South African Preserves.
Miss D. Carter, Rye : Preserves.

FLORAL COMMITTEE.

JULY 8, 1924.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and thirteen other members present.

Awards Recommended:—

Gold Medal.

To Messrs. Blackmore & Langdon, Bath, for Delphiniums.

Silver-gilt Banksian Medal.

To Messrs. Chaplin, Waltham Cross, for Roses.

To Mr. H. J. Jones, Lewisham, for Delphiniums.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Barr, Taplow, for hardy plants.

To Messrs. Bath, Wisbech, for Delphiniums, etc.

To Messrs. B. R. Cant, Colchester, for Roses.

To Mr. T. Carlile, Twyford, for Delphiniums.

To Mr. J. Douglas, Great Bookham, for Border Carnations.

To Messrs. McGredy, Portadown, for Roses.

To Messrs. Kelway, Langport, for Delphiniums.

To Messrs. Ladhams, Southampton, for hardy plants.

To Messrs. Lowe, Beeston, for Roses.

To Messrs. Prichard, Christchurch, for hardy plants.

To Messrs. Waterer, Sons & Crisp, Twyford, for Delphiniums.

Bronze Banksian Medal.

To Messrs. Easlea, Leigh-on-Sea, for Roses.

To Mr. C. Engelmann, Saffron Walden, for Carnations.

To Messrs. Harkness, Bedale, for hardy plants.

To Messrs. S. Low, Bush Hill Park, for Carnations.

To Orpington Nurseries, Orpington, for Delphiniums and Irises.

To Messrs. Carter Page, London, for hardy plants.

To Mr. J. H. Pemberton, Havering-atte-Bower, for Roses.

To Mr. A. Perry, Enfield, for hardy plants.

To Messrs. Prior, Colchester, for Roses.

To Mr. F. G. Wood, Ashted, for hardy plants.

Award of Merit.

To Begonia 'Albatros' (votes unanimous), from Messrs. Blackmore & Langdon, Bath. A very large double white variety of excellent form.

To Begonia 'Lady Ann' (votes unanimous), from Messrs. Blackmore & Langdon, Bath. A very large double pink variety.

To Carnation 'Sultan' (votes unanimous), from Mr. J. Douglas, Great Bookham. A bright orange Border variety of good form.

To *Coreopsis auriculata superba* (votes unanimous), from Messrs. Ladhams, Southampton. An excellent hardy plant for cutting and market work. Its large single golden-yellow flowers, measuring three inches across, are borne on long stiff stems. A serrated band of dark brown encircles the golden disc.

To Delphinium 'The Shah' (votes 8 for, 1 against), from Messrs. Blackmore & Langdon, Bath. This variety produces long and finely proportioned spikes of large flowers, the outer petals being cornflower-blue and the inner ones lavender-mauve. The eye is dark and the plant is said to possess an exceptionally strong constitution.

To Rose 'Fragrance' (votes unanimous), from Messrs. Chaplin, Waltham Cross. This variety was raised by the exhibitors and resulted from a cross between 'George Dickson' and 'Hoosier Beauty.' It is bright crimson in colour and of good form and substance.

To Rose 'Lord Lambourne' (votes 9 for), from Messrs. S. McGredy, Portadown. This hybrid perpetual variety has very large flowers of a deep cream

colour deepening to yellow at the base and edged with pink. It is a very strong grower and a profuse bloomer.

The following awards recommended to Sweet Williams, after trial at Wisley, were confirmed :—

Award of Merit.

2. 'White,' sent by Messrs. Dobbie, Edinburgh.
9. 'Pink Beauty' } (alike) { sent by Messrs. Pennell, Lincoln.
13. 'Pink' } (alike) { sent by Messrs. Carter, Raynes Park.
- 17, 24. 'Scarlet Beauty,' sent by Messrs. Dobbie and Messrs. Cullen, Witham.
28. 'Crimson,' sent by Messrs. R. Veitch, Exeter.
33. 'Nigrescens,' sent by Messrs. Barr, London.
37. 'Auricula-eyed Extra Large,' sent by Messrs. Barr, London.
- 46, 47. 'Holborn Glory,' sent by Messrs. Carter, and Messrs. Watkins & Simpson, London.
52. 'Mixed Hybrids,' sent by Mr. W. J. Unwin, Histon.
60. 'Double Mixed Improved,' sent by Messrs. Barr, London.

Highly Commended.

14. 'Copper King' } (alike) { sent by Messrs. Barr, London.
15. 'Copper Red' } (alike) { sent by Messrs. R. Veitch, Exeter.
18. 'Scarlet Beauty' (alike with 'Scarlet Beauty,' 17, 24), sent by Messrs. Carter, Raynes Park.
31. 'Dunnett's Dark Crimson,' sent by Messrs. Barr, London.
42. } 'Auricula-eyed' { sent by Messrs. R. Veitch, Exeter.
43. } 'Auricula-eyed' { sent by Messrs. W. H. Simpson, Birmingham.
45. 'Auricula-eyed' (Dean's), sent by Messrs. Barr, London.
50. 'Holborn Glory,' sent by Messrs. R. Veitch, Exeter.
54. 'Perfection' (Hunt's), sent by Messrs. Barr, London.
59. 'Double Mixed,' sent by Messrs. W. H. Simpson, Birmingham.

Award of Merit.

Ranunculus asiaticus, Dr. Ragionieri's strain, sent by Dr. Attilio Ragionieri, Castello (Firenze), Italy.

Other Exhibits.

G. P. Baker, Esq., Bexley : *Hemerocallis* 'Sirius.'
 Messrs. F. Cant, Colchester : Roses.
 Chalk Hill Nursery, Reading : hardy plants.
 Mr. C. G. Collyer, Lymington : Pink 'Lady Power.'
 Messrs. Daniels, Norwich : Candytuft 'Daniels' Mammoth Spiral.'
 Mr. Hemsley, Crawley : hardy plants.
 Misses Hopkins, Shepperton : hardy plants.
 Mr. A. G. Inkpen, Ware : Carnation 'Mrs. R. P. Croft.'
 Messrs. Ireland & Hitchcock, Marks Tey : 'Mascotts' *Dianthus*.
 Messrs. Jones & Ingwersen, Letchworth : hardy plants.
 Mr. A. J. Morten, Gloucester : Roses.
 Messrs. Reamsbottom, West Drayton : *Anemones*.
 Messrs. Rich, Bath : hardy plants.
 Messrs. Russell, Richmond : stove plants.
 Messrs. Sanders, St. Albans : *Anthuriums*.
 Messrs. Stark, Great Ryburgh : hardy plants.
 Mr. W. Wells, jun., Merstham : hardy plants.

Section B.

Mr. G. W. E. Loder in the Chair, and fifteen other members present.

Awards Recommended :—

Silver Banksian Medal.

To Miss S. S. Thompson, Birmingham, for Cacti.
 To Messrs. Wallace, Tunbridge Wells, for Lilies.

Bronze Banksian Medal.

To Mr. H. Hemsley, Crawley, for alpines.
 To Mr. G. Reuthe, Keston, for shrubs and alpines.

First-class Certificate.

To *Lilium Farreri* (votes 9 for, 4 against), from Lt.-Col. Messel, O.B.E., Handcross. This beautiful Chinese Lily, seeds of which were sent home by the late Mr. R. Farrer, received an Award of Merit at Chelsea Show on June 1, 1920. Since that time it has established itself as a good garden Lily. Its flowers are white, with recurving segments spotted with claret-crimson. There is also some purple at the base of the segments.

Award of Merit.

To *Atraphaxis Billardieri* (votes unanimous), from the Royal Botanic Garden, Kew. An uncommon semi-prostrate, deciduous shrub belonging to the *Polygonaceae*. Its flowers have no petals but four or five pinkish-veined sepals which ultimately surround the black fruit. The plant produces fairly long arching growths and is very attractive.

To *Campanula Zoysii* (votes 10 for), from Messrs. Tucker, Oxford. This charming and uncommon species is a native of North Italy and Austria. It is very dwarf in habit and has radical leaves about one-third of an inch long with ciliate margins. The characteristic oblong tubular or urn-shaped flowers are about 1 inch long and are light purplish-blue in colour.

Other Exhibits.

Mr. C. G. Collyer, Lymington : *Helichrysum anatolicum*.

Messrs. Jones & Ingwersen, Letchworth : *Eritrichium nanum*.

Messrs. Ladhams, Southampton : *Iris laevigata* 'Rose Queen.'

Mrs. G. Preston, Hayes : *Clematis warrenensis*.

Mr. F. G. Wood, Ashted : *Campanula Jenkinsae*.

FLORAL COMMITTEE, JULY 22, 1924.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and thirteen other members present.

Awards Recommended:—

Gold Medal.

To Messrs. Dobbie, Edinburgh, for Zinnias.

Silver-gilt Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Chaplin, Waltham Cross, for Roses.

To Hon. Vicary Gibbs, Elstree, for Cape Pelargoniums.

To Mr. H. J. Jones, Lewisham, for Phloxes.

To Messrs. Kelway, Langport, for Gladioli.

Silver Banksian Medal.

To Messrs. B. R. Cant, Colchester, for Roses.

To Messrs. Carter, Raynes Park, for *Trachelium coeruleum*.

To Mr. J. R. Crowhurst, Burgess Hill, for Carnations.

To Messrs. Daniels, Norwich, for Roses and Sweet Peas.

To Messrs. Easlea, Leigh-on-Sea, for Roses.

To Mr. Herbert, Birmingham, for Pinks.

To Messrs. Ladhams, Southampton, for hardy plants.

To Messrs. Lowe & Gibson, Crawley Down, for Carnations and Gladioli.

To Mr. J. H. Pemberton, Romford, for Roses.

To Mr. A. Perry, Enfield, for hardy plants.

To Messrs. Prichard, Christchurch, for hardy plants.

To Messrs. Waterer, Sons & Crisp, Twyford, for Phloxes, etc.

Bronze Banksian Medal.

To Messrs. F. Cant, Colchester, for Roses.

To Mr. T. Carlile, Twyford, for hardy plants.

To Chalk Hill Nurseries, Reading, for hardy plants.

To Mr. C. Engelmann, Saffron Walden, for Carnations.

To Mr. H. Hemsley, Crawley, for hardy plants.

To Messrs. Prior, Colchester, for Roses.

To Mr. W. Wells, jun., Merstham, for hardy plants.

Award of Merit.

To Carnation 'Sir Charles Seely' (votes unanimous), from Mr. E. C. Goble, Ryde. A fine scarlet Border variety of medium size and good form. It is scented, has a good calyx, and is said to be a vigorous grower.

To *Hemerocallis hybrida* 'Lady Hesketh' (votes unanimous), from Mr. A. Perry, Enfield. This useful hardy plant originated as the result of a cross between *H. Thunbergi* and *H. citrina*. Its good clear yellow flowers are borne on long stems.

To Zinnia 'Giant Dahlia flowered strain' (votes 6 for, 1 against), from Messrs. Dobbie, Edinburgh. A very fine strain growing about 2½ feet high, bearing large double flowers resembling Camellia-flowered Dahlias in form. The colours include shades of yellow, orange, rose-pink, deep rose, crimson and scarlet.

Other Exhibits.

Messrs. Barr, Taplow: *Richardia* 'Lemon Queen.'

J. E. C. Boulds, Esq., Saltash: Carnations.

Mr. F. Carter, Tiverton: Carnations.

Major Churcher, Lindfield: Gladioli.

Major A. C. H. Dixon, Bushey: *Antirrhinum variegatum argenteum*.

Mr. W. H. Gardiner, Thorington: *Eschscholzia* 'Winsome.'

Messrs. Groom, Gosport: Border Carnations.

Misses Hopkins, Shepperton: hardy plants.

Messrs. House, Westbury-on-Trym: Scabious.

Mr. S. Miller, Newport: *Chrysanthemum maximum* 'Wight Giant.'

Messrs. Reamsbottom, West Drayton: Anemones.

Messrs. Stokes, Trowbridge: *Chrysanthemum maximum* 'Empire.'

Messrs. Tucker, Oxford: hardy plants.

Mr. F. G. Wood, Ashted: hardy plants.

Section B.

Mr. G. W. E. LODER in the Chair, and sixteen other members present.

Awards Recommended:—*Bronze Banksian Medal.*

To Mr. G. Reuthe, Keston, for herbaceous and alpine plants.

To Messrs. L. R. Russell, Richmond, for shrubs and climbers.

Award of Merit.

To *Lagerstroemia indica* (votes unanimous), from the Botanic Garden, Cambridge. A beautiful Chinese tree with terminal heads of curious crinkled claw-petalled pink flowers and opposite ovate leaves. It is a tender plant and requires protection in this country.

Other Exhibits.

Messrs. Prichard, Christchurch: *Tunica Saxifraga rosea plena*.

Messrs. Tucker, Oxford: *Campanula Wockei*.

Messrs. R. Veitch, Exeter: *Plagianthus Lyalli* var. *glabrata*.

FLORAL COMMITTEE, AUGUST 12, 1924.

Mr. H. B. MAY, V.M.H., in the Chair, and twelve other members present.

*Section A.***Awards Recommended:—***Gold Medal.*

To Messrs. Sutton, Reading, for Gladioli.

Silver-gilt Banksian Medal.

To Messrs. Bolton, Baythornend, for Sweet Peas.

To Messrs. Chaplin, Waltham Cross, for Roses.

To Mr. H. J. Jones, Lewisham, for Phloxes, etc.

To Messrs. Kelway, Langport, for Gladioli.

Silver Banksian Medal.

- To Messrs. Allwood, Haywards Heath, for Carnations.
 To Messrs. Bath, Wisbech, for Gladioli.
 To Major Churcher, Lindfield, for Gladioli.
 To Messrs. Cuthbert, Southgate, for Streptocarpus.
 To Messrs. Cheal, Crawley, for Dahlias.
 To Donard Nursery Co., Newcastle, Co. Down, for Dieramas.
 To Messrs. Easlea, Leigh-on-Sea, for Roses.
 To Mr. Edwards, Fordham, for Gladioli.
 To Messrs. House, Westbury-on-Trym, for Scabious.
 To Messrs. Lowe & Gibson, Crawley Down, for Gladioli.
 To Messrs. Ladhams, Southampton, for hardy plants.
 To Mr. J. H. Pemberton, Havering-atte-Bower, for Roses.
 To Messrs. Sutton, Reading, for Zinnias.
 To Messrs. Vert, Saffron Walden, for Hollyhocks.
 To Mr. Yandell, Maidenhead, for Violas.

Bronze Banksian Medal.

- To Messrs. Prichard, Christchurch, for hardy plants.
 To Messrs. Prior, Colchester, for Roses.
 To Mr. A. Perry, Enfield, for hardy plants.
 To Mr. W. Wells, jun., Merstham, for hardy plants.

Award of Merit.

To *Dierama pulcherrimum* 'Kingfisher' (votes unanimous), from the Donard Nursery Co., Newcastle, Co. Down. A good pale-pink variety of this graceful plant. The flowers are large and hang down from the long arching growths.

To *Gladiolus* 'E. H. Liddell' (votes unanimous), from Messrs. Kelway, Langport. The flowers of this variety are borne in a good bold spike and are of a rosy-mauve colour. The lower petals are heavily blotched with cream.

The following awards recommended to Sweet Peas on trial at Wisley were confirmed:—

Award of Merit.

FLOWERS WHITE.

- | | |
|-------------------------|--------------------------------------|
| 3. 'Joan Ryder,' | sent by Messrs. Ryder, St. Albans. |
| 11. 'King White' | |
| 95. 'Mascotts White' | } too much
alike |
| 97. 'Edna May Improved' | |
| 18. 'Constance Hinton,' | sent by Messrs. A. Dickson, Belfast. |
| 19. " " | sent by Messrs. Dobbie, Edinburgh. |
| 20. " " | sent by Messrs. W. J. Unwin, Histon. |

FLOWERS CREAM.

- | | |
|-------------------------------|--|
| 23. 'Cream Constance Hinton,' | sent by Dr. H. T. Hinton, Heytesbury, Wilts. |
| 27. 'Matchless,' | sent by Messrs. Dobbie, Edinburgh. |
| 98. " " | sent by Messrs. Ireland & Hitchcock. |
| 33. 'Majestic Cream' | } much { sent by Messrs. W. J. Unwin, Histon. |
| 37. 'Hawthorn Cream' | |
| | } alike { sent by Messrs. A. Dickson, Belfast. |
| 40. 'Paradise Ivory,' | sent by Messrs. Kelway, Langport. |

FLOWERS CRIMSON.

- | | | |
|------------------------|-----------------|--|
| 41. 'Charity' | } much
alike | sent by Messrs. J. Stevenson, Wimborne. |
| 42. " " | | sent by Messrs. W. J. Unwin. |
| 46. " " | | sent by Messrs. J. K. King, Coggeshall. |
| 47. " " | | sent by Messrs. Ireland & Hitchcock. |
| 48. " " | | sent by Messrs. Barr, London. |
| 49. " " | | sent by Messrs. R. Veitch, Exeter. |
| 50. 'Crimson, Unwin's' | | sent by Messrs. W. J. Unwin. |
| 60. 'Crimson King' | } alike | sent by Messrs. Morse, San Francisco. |
| 61. " " | | sent by Messrs. Dobbie, Edinburgh. |
| 53. " " | | sent (as 'Field-Marshal') by Messrs. Webb Stourbridge. |

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|------------------------|---------|---------------------------------|---------------------------|
| 55. 'Maud Holmes' | } alike | { sent by Messrs. Barr, London. | |
| 56. 'Sunproof Crimson' | | | { sent by Messrs. Dobbie. |
| 57. " " " | | | { sent by Messrs. Kelway. |

FLOWERS MAROON.

- | | | | |
|-------------------|-----------------|---|--|
| 68. 'Warrior' | } much
alike | { sent by Messrs. Dobbie. | |
| 69. " " | | | { sent by Messrs. W. J. Unwin. |
| 70. " " | | | { sent by Messrs. A. Dickson. |
| 71. " " | | | { sent by Messrs. W. H. Simpson. |
| 72. " " | | | { sent by Messrs. J. K. King. |
| 73. " " | | | { sent by Messrs. Webb. |
| 100. " " | | | { sent by Messrs. Ireland & Hitchcock. |
| 74. 'Nubian' | | | { sent by Messrs. Kelway. |
| 75. 'Maroon King' | | { sent by Messrs. F. C. Woodcock, Walmer. | |

Other Exhibits.

Mr. A. E. Amos, Colchester : *Gladiolus* 'Herada.'

Mr. C. Engelmann, Saffron Walden : Carnations.

Misses Hopkins, Shepperton : hardy plants.

Messrs. Russell, Richmond : greenhouse plants.

Section B.

Mr. G. W. E. LODER in the Chair, and nine other members present.

Awards Recommended :—

Bronze Banksian Medal.

To Mr. G. Reuthe, Keston, for shrubs, alpine, etc.

First-class Certificate.

To *Hoheria populnea lanceolata* (votes 7 for, 1 against), from G. W. E. Loder, Esq., Ardingly. A beautiful New Zealand shrub with light green lanceolate leaves irregularly serrated, and pretty white five-petalled flowers about $\frac{3}{4}$ inch across, borne on axillary stalks 1 inch long.

Award of Merit.

To *Bomarea cantabrigiensis* (votes unanimous), from the Botanic Garden, Cambridge. This interesting climber grows in the open at Cambridge and originated as the result of a cross between *B. Caldasiana* and *B. hirtella*. Its leaves are lanceolate and about $2\frac{1}{2}$ inches long. The flowers are tubular and about 1 inch in length. They are light red outside, becoming yellow at the top, and inside they are yellow spotted with black.

To *Clethra Fargesii* (votes unanimous), from Colonel Stephenson Clarke, Cuckfield. A shrub with ovate leaves about $2\frac{1}{2}$ inches long and having a red midrib. The racemes of small white flowers with creamy calyces are borne in great abundance.

To *Hydrangea albo-rosea* (votes unanimous), from G. W. E. Loder, Esq., Ardingly. The inconspicuous fertile flowers are small and creamy white, while the showy sterile flowers are composed of wide overlapping serrated ovate sepals of a deep crimson-rose colour.

To *Hydrangea opuloides coerulescens* (votes unanimous), from G. W. E. Loder, Esq., Ardingly. The larger barren flowers have smooth-edged bright pink or white sepals, which form a striking contrast with the small blue fertile flowers.

Cultural Commendation.

To the Director, Cambridge Botanic Garden, for *Eustoma Russellianum*.

Other Exhibits.

H. H. Claydon, Esq., Bishop's Stortford : miniature rock garden.

W. Hales, Esq., A.L.S., Chelsea : *Cestrum Parqui*.

Messrs. Laird & Dickson, Edinburgh : *Sedum Praegerianum*.

Dame Alice Godman, Horsham : *Acanthopanax ricinifolia*, *Cyananthus Hookeri*.

Mr. W. Wells, jun., Merstham : *Astilbe chilense pumila*.

Colonel Stephenson Clarke, Cuckfield : *Clethra barbinervis*, *Hydrangea involucreta*, *Ilex ilicifolia*, *Olearia aviceniæfolia*.

G. W. E. Loder, Esq., Ardingly : *Hydrangea Sargentiana*. A.M. May 22, 1912.

FLORAL COMMITTEE, AUGUST 26, 1924.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and eleven other members present.

Awards Recommended:—

Silver-gilt Banksian Medal.

To Messrs. Kelway, Langport, for Gladioli.

Silver Banksian Medal.

To Messrs. Cheal, Crawley, for Phloxes.

To Messrs. Chaplin, Waltham Cross, for Roses.

To Mr. Edwards, Fordham, for Gladioli.

To Messrs. House, Westbury-on-Trym, for Scabious.

To Mr. J. H. Pemberton, Havering-atte-Bower, for Roses.

To Messrs. Prior, Colchester, for Roses.

To Messrs. Stredwick, St. Leonards, for Dahlias.

To Mr. Yandell, Maidenhead, for Violas.

Bronze Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Easlea, Leigh-on-Sea, for Roses.

To Mr. C. Engelmann, Saffron Walden, for Carnations.

To Messrs. Rich, Bath, for Phloxes.

To Mr. F. G. Wood, Ashted, for hardy plants.

The following awards recommended to Annual Scabious on trial at Wisley were confirmed:—

DWARF.

Highly Commended.

16. 'Dwarf Rosy-Lilac,' sent by Messrs. Nutting, London.

18. 'Dwarf Blue,' sent by Messrs. Nutting, London.

21. 'Peter Pan,' sent by Messrs. R. Veitch, Exeter.

25. 'Dwarf Reddish-Black,' sent by Messrs. Nutting, London.

MEDIUM.

Highly Commended.

7. 'Rose Queen,' sent by Messrs. A. Dickson, Belfast.

8. 'Cerise Queen,' sent by Messrs. A. Dickson, Belfast.

12. 'Crimson Queen,' sent by Messrs. A. Dickson, Belfast.

17. 'Azure Queen,' sent by Messrs. A. Dickson, Belfast.

20. 'Purple Queen,' sent by Messrs. A. Dickson, Belfast.

23. 'The Sultan,' sent by Messrs. A. Dickson, Belfast.

TALL.

Award of Merit.

28. 'Snowball,' sent by Messrs. R. Veitch, Exeter.

29. 'Snowball,' sent by Messrs. L. Daehnfeldt, Ltd., Odense, Denmark.

60. 'Bright Crimson,' sent by Messrs. W. H. Simpson, Birmingham.

Highly Commended.

59. 'Treasure,' sent by Messrs. R. Veitch

57. 'Fire King,' sent by Messrs. Watkins & Simpson

} Too much alike.

Award of Merit.

65. 'Black King,' sent by Messrs. Barr, London.

69. 'Azure Fairy,' sent by Messrs. Dobbie, Edinburgh

Highly Commended.

67. 'Fairy,' sent by Messrs. Barr, London

74. 'Azure Fairy,' sent by Messrs. L. Daehnfeldt, Ltd.

62. 'Crimson and White,' sent by Messrs. Dobbie.

80. 'Pompadour,' sent by Messrs. Dobbie.

83. 'Large Flowered Black,' sent by Messrs. J. Carter, Raynes Park

87. 'Bedding Strain Improved,' sent by Messrs. Barr, London.

94. 'Flesh Pink,' sent by Waller Seed Co., Guadalupe, Cal., U.S.A.

} Alike.

} Alike.

The following Dahlias were selected by the Joint Dahlia Committee for trial at Wisley :—

From Messrs. Cheal, Crawley :

'Charlwood Star' (Star), 'Ulick' (Camellia).

From A. J. Cobb, Esq., Reading :

'St. Davids' (Min. Pæony).

From Messrs. Stredwick, St. Leonards :

'Alice Amos' (Cactus), 'Berengaria' (Dec.), 'Christine Prior' (Dec.), 'Grandeur' (Dec.), 'Kitty Rogers' (Dec.), 'Prestige' (Hyb. Cactus), 'Sheila Ward' (Dec.), 'Snow Bunting' (Cactus), 'Uncle Dick' (Dec.), 'Wembley' (Dec.).

Other Exhibits.

E. Burman, Esq., Leicester : Carnation 'Earls Pride.'

Messrs. Hemsley, Crawley : Phloxes and Dahlias.

Misses Hopkins, Shepperton : Blue Pea.

Messrs. Scott & Wickham, Witley : Chrysanthemums.

Section B.

Mr. W. J. BEAN, V.M.H., in the Chair, and seven other members present.

Awards Recommended :—

Bronze Banksian Medal.

To Mr. G. Reuthe, Keston, for hardy plants.

To Messrs. Russell, Richmond, for shrubs and climbers.

Award of Merit.

To *Clerodendron ugandense* (votes 7 for), from the Royal Botanic Gardens, Kew. An East African greenhouse shrub with serrate lanceolate leaves borne in threes. The flowers are pale blue inside and white outside, with a deep blue lip and very long curved filaments to the stamens.

To *Cotoneaster rubens* (votes 7 for), from the R.H.S. Gardens, Wisley. This useful semi-prostrate species has dark green leaves, and is very freely furnished with large dull red flattened berries which acquire their beautiful colour quite early in the season. It has fairly large conspicuous flowers.

To *Eucryphia* 'Nymansay' (votes 6 for), from Lieut.-Col. Messel, O.B.E., Handcross. This handsome evergreen shrub or small tree is a natural hybrid between *E. pinnatifolia* and *E. cordifolia*. It has very large white flowers $3\frac{1}{2}$ inches wide, with broad ovate petals. Its leaves are compound, lanceolate, serrated and shiny. It is a robust grower, and is apparently as hardy as *E. pinnatifolia* and much harder than *E. cordifolia*.

To *Euonymus alatus* F. 392 (votes 7 for), from F. C. Stern, Esq., Goring-by-Sea. One of the late Mr. Farrer's introductions, bearing large, handsome, broadly ovate, light green leaves and clusters of large delicate pale pink fruits. It is a quick grower and soon forms a tree.

To *Euonymus yedoensis* (votes 4 for, 1 against), from the Royal Botanic Gardens, Kew. A hardy Japanese shrub with light green ovate leaves and clusters of cerise-pink fruits, which are produced very abundantly.

To *Gaultheria pyrolloides* (votes 7 for), from the R.H.S. Gardens, Wisley. A dwarf hardy shrub with very dark green elliptical leaves and numerous pure white rounded berries.

To *Pyrus americana nana* (votes 6 for), from the Royal Botanic Gardens, Kew. A hardy tree with dark green serrated pinnate leaves and masses of big round scarlet fruits.

To *Syringa Juliana* (votes 7 for), from F. C. Stern, Esq., Goring-by-Sea. A very strongly scented species with small white flowers having relatively long tubes.

To *Syringa Potaninii* (votes 7 for), from F. C. Stern, Esq., Goring-by-Sea. This species is also sweetly scented, and its flowers are pink outside and whitish inside. The opposite lanceolate leaves are dark green above and lighter below.

Other Exhibits.

Col. Stephenson Clarke, Cuckfield : *Hoheria populnea*.

Hon. R. James, Richmond : *Cryta vallota*.

F. Roberts, Esq., Leigh-on-Sea : *Pyrus* in fruit.

FLORAL COMMITTEE, SEPTEMBER 9, 1924.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and fourteen other members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

- To Messrs. Artindale, Sheffield, for Gladioli.
- To Messrs. Dobbie, Edinburgh, for Dahlias.
- To Messrs. Kelway, Langport, for Gladioli.
- To Messrs. Sutton, Reading, for Dahlias.
- To University College, Reading, for seedling Dahlias.

Silver Banksian Medal.

- To Messrs. Allwood, Haywards Heath, for Carnations.
- To Messrs. Bath, Wisbech, for Gladioli.
- To Messrs. Cuthbert, Southgate, for Streptocarpus and Nerines.
- To Mr. Edwards, Fordham, for Gladioli.
- To Messrs. Lowe & Gibson, Crawley Down, for Gladioli.
- To Messrs. Luxford, Harlow, for Chrysanthemums.
- To the National Dahlia Society of Holland, for Dahlias.
- To Messrs. Carter Page, London, for Dahlias.
- To Mr. A. Perry, Enfield, for hardy plants.
- To Mr. J. B. Riding, Chingford, for Dahlias.
- To Messrs. Velthuys, Hillegom, Holland, for Gladioli and Dahlias.

Bronze Banksian Medal.

- To Mr. T. Carlile, Twyford, for hardy plants.
- To Mr. C. Engelmann, Saffron Walden, for Carnations.
- To Messrs. House, Westbury-on-Trym, for Scabious.
- To Messrs. Ladhams, Southampton, for hardy plants.
- To Mr. J. H. Pemberton, Havering-atte-Bower, for Roses.
- To Messrs. Scott & Wickham, Witley, for Chrysanthemum 'Phoenix.'
- To Messrs. S. Low, Bush Hill Park, for Carnations.
- To Mr. F. G. Wood, Ashted, for hardy plants.
- To Mr. Yandell, Maidenhead, for Violas.

Award of Merit.

To Chrysanthemum 'Australian Gold' (votes 6 for, 2 against), from Mr. H. Woolman, Birmingham. A showy, bright old gold, early-flowering variety of good size and substance.

To Chrysanthemum 'Bronze Early Buttercup' (votes 8 for, 1 against), from Mr. H. Woolman, Birmingham. An early-flowering bronze variety of loosely incurving form.

To Chrysanthemum 'Sunburst' (votes unanimous), from Mr. H. Woolman, Birmingham. A very attractive early-flowering variety. The golden flowers are orange tinted and are borne on long stiff stems.

To Helenium 'Mrs. Bradshaw' (votes 6 for, 2 against), from Mr. A. Perry, Enfield. A very handsome variety of *H. striatum*, with large deep brownish-crimson flowers of good substance.

The following Dahlias were selected by the Joint Dahlia Committee for trial at Wisley :—

- From Mr. J. G. Ballego, Leiden, Holland :
'Emma Groot' (Dec.), 'Secretaris Voors' (Dec.).
- From Mr. H. Carlee, Heemstede, Holland :
'Menny Carlee' (Dec.), 'Mrs. Euchede Koog' (Dec.), 'Mr. John Dix' (Dec.).
- From Mr. A. J. Cobb, Reading :
'Mrs. Skevington' (Pæony).
- From Mr. F. Topsvoort, Aalsmeer, Holland :
'John Mensing' (Dec.).

Other Exhibits.

- Mr. C. P. Alkemade, Noordwijke, Holland : *Gladiolus* 'Imperator.'
 Mrs. H. Baring, Waltham Abbey : *Heliotrope* 'Mrs. Harold Baring.'
 Mr. V. Deursen, Losse, Holland : *Gladiolus* 'Rubini.'
 Mr. J. Glasbergen, Leiden, Holland : *Dahlia* 'Murillo.'
 Misses Hopkins, Shepperton : blue *Pea*.
 Mr. J. J. Kettle, Corfe Mullen : *Violets*.
 Mr. C. Kroon, Baam, Holland : *Dahlia* 'Zonsopgang.'
 Messrs. Reamsbottom, West Drayton : *Anemones*.
 Messrs. Rich, Bath : *Phloxes*.
 W. van der Weyer, Esq., Dorchester : *Begonias*.
 Messrs. R. Veitch, Exeter : *Scabious* 'Azure Fairy.'
 Mr. C. Vianen, Rynsburg, Holland : *Dahlia* 'King George.'

Section B.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Cheal, Crawley, for shrubs.

Bronze Banksian Medal.

To Messrs. Russell, Richmond, for climbers.

Award of Merit.

To *Hibiscus Waimeae* (votes 12 for), from the Royal Botanic Gardens, Kew. This beautiful *Hibiscus* is a native of the Hawaiian Archipelago, and at Kew it flourishes in a sunny position in the Mexican section of the Temperate House. In its native habitat it makes a tree up to 25 feet high. The leaves are wide elliptic-ovate, with purplish veins and crenate-serrate margins. The flowers, which are solitary, are borne in the upper axils. They have a white corolla and a tubular green calyx. The most striking feature of the flower is the long staminal tube, which is of a reddish colour towards the upper part.

Other Exhibits.

- R. W. Ascroft, Esq., East Molesey : *Lupinus Hartwegii*.
 A. C. Charrington, Hever : *Campanula* 'Anne Boleyn.'
 A. K. Drummond, Esq., Swansea : *Aucuba crotonoides Drummondii*.
 W. Van der Weyer, Esq., Dorchester : hybrid *Buddleias*.

SEPTEMBER 10, 1924.

On the occasion of the Dahlia Show the following Dahlias were selected by the Joint Dahlia Committee for trial at Wisley :—

From H. L. Broussor, Esq., Blackheath :

'Dorothy Carlile' (Star).

From Messrs. Burrell, Cambridge :

'Endora' (Small *Pæony*), 'Freda' (Small *Camellia*), 'Glamour' (Min. *Pæony*), 'Irina' (Small *Pæony*), 'Kate' (Min. *Pæony*), 'Lucina' (Small *Pæony*), 'Mary', 'Molly' (Min. *Pæony*), 'Persis' (Min. *Pæony*), 'Tanara' (Min. *Pæony*).

From Messrs. Cheal, Crawley :

'Burstow Star' (Star), 'Lady Heath' (*Pæony*), 'Lady Le Bas' (Coll.), 'Mrs. Eustace Berry' (Coll.).

From Mr. A. J. Cobb, Reading :

'Nigra' (Min. *Pæony*), 'Shinfield Star' (Star).

From Mr. H. Shoesmith, Guildford :

'Acone' (Cactus).

From Messrs. Stredwick, St. Leonards-on-Sea :

'Dr. Grace Nevill' (Dec.), 'Dragoon' (Cactus), 'Fred. Ransom' (Dec.), 'Hawthorne' (Cactus), 'Mrs. Meadows' (Dec.), 'Princess Louise' (Dec.), 'Radio' (Cactus), 'Romeo' (Dec.), 'White Eagle' (Dec.).

From Mr. C. Turner, Slough :

'Anita' (Min. *Pæony*).

FLORAL COMMITTEE, SEPTEMBER 23, 1924.

Section A.

At Holland Park Skating Rink.

Mr. H. B. MAY, V.M.H., in the Chair, and twelve other members present.

Awards Recommended :

To Aster 'Maid of Athens' (votes unanimous), from Mr. E. Ballard, Colwall. This is a late-flowering variety, growing from 4 to 5 feet high. It has large flowers with broad rays of rich rosy-lilac colour. The plant is a very robust grower and forms a sturdy branching pyramid.

To Aster 'Royal Blue' (votes unanimous), from Mr. E. Ballard, Colwall. A mid-season to late variety of medium height. Its flowers are large and of a rich deep blue colour, with a tendency to double at first.

To Aster 'Thora Perry' (votes unanimous), from Mr. A. Perry, Enfield. A large very pale lavender double variety becoming almost white at the base of the florets. It grows from 2½ to 3 feet high.

To Chrysanthemum 'Brilliancy' (votes unanimous), from Mr. H. Woolman, Birmingham. An early-flowering garden variety. It is of a deep chestnut-bronze colour with the golden reverse showing in the centre.

To Chrysanthemum 'Illuminator' (votes unanimous), from Mr. H. Woolman, Birmingham. A very striking salmon-bronze early-flowering garden Chrysanthemum.

To Chrysanthemum 'Kathleen Wells' (votes unanimous), from Messrs. Wells, Merstham. A pure white Japanese variety of medium size and good substance.

To Chrysanthemum 'Lichfield Peach' (votes unanimous), from Mr. A. W. Thorpe, Lichfield. A seedling of quite a new and novel colour. The flowers are of medium size and the florets are narrow and slightly rolled. The colour is a pale pink with a pale buff reverse in the young stage. The height of the plant is 3 feet.

To Chrysanthemum 'Salmon Profusion' (votes unanimous), from Mr. Yandell, Maidenhead. A very striking variety of medium size. The colour is pale golden buff tinged with salmon.

To Chrysanthemum 'Silver Queen' (votes 8 for), from Mr. H. Woolman, Birmingham. A large-flowered early garden variety of a deep rose colour with a silvery reverse.

To *Eustoma Russellianum* 'The Oxford' (votes 7 for, 1 against), from Mr. C. J. Ellis, Weston-super-Mare. A very dark blue variety of this handsome greenhouse plant which seems to be very little cultivated now.

To *Gladiolus* 'Nora Toomer' (votes unanimous), from the Orpington Nurseries, Orpington. This handsome variety was raised by Mr. A. J. Bliss. Its flowers are well placed on a bold spike. They are deep salmon with a scarlet blotch on the lower petal and faint white lines down the middle of the others.

The following awards recommended to Dahlias on trial at Wisley were confirmed :—

Single.

- Type A. 2. 'Little Jennie,' A.M., sent by Messrs. W. Treseder, Cardiff.
- Type B. 4. 'Nanno,' A.M., sent by Messrs. W. Treseder, Cardiff.

Colerette.

- 17. 'Mrs. M. Perry,' H.C., sent by Messrs. W. Treseder, Cardiff.

Pæony.

- 30. 'The Rose,' A.M., sent by Messrs. Velthuys, Holland.

Small-flowered Pæony.

- 46. 'Rosie,' A.M., sent by Messrs. J. Burrell, Cambridge.
- 29. 'Rosie Supreme' A.M., sent by Messrs. Jarman & Co., Chard. } Identical.
- 40. 'Nutfield Priory,' H.C., sent by Messrs. J. Cheal, Crawley.
- 42. 'Sweet,' A.M., sent by Mr. A. J. Cobb, Reading.
- 50. 'Charmer,' A.M., sent by Messrs. J. Burrell.
- 52. 'Norah Bell,' A.M., sent by Messrs. J. Burrell.
- 54. 'Vimy,' H.C., sent by Messrs. J. Cheal.
- 88. 'Gwynne,' A.M., sent by Messrs. J. Burrell.

Decorative.

60. 'Polar Bear,' A.M., sent by Mr. E. Beckett, Elstree.
 69. 'Emblem,' A.M., sent by Messrs. J. Burrell, Cambridge.

Small-flowered Decorative.

85. 'Carine,' A.M., sent by Messrs. J. Burrell, Cambridge.
 86. 'Thursa,' A.M., sent by Messrs. J. Burrell, Cambridge.

Camellia.

95. 'Nelly,' A.M., sent by Mr. H. Carlee, Holland.

Star.

113. 'Haslemere Star,' A.M., sent by Messrs. J. Cheal.
 121. 'Hindhead Star,' A.M., sent by Messrs. J. Cheal.
 126. 'Reading Star,' A.M., sent by Mr. A. J. Cobb.

Cactus.

131. 'Joyce Goddard,' A.M., sent by Messrs. Jarman & Co.
 135. 'Mrs. Forester Paton,' A.M., sent by Messrs. J. Cheal.

The following Dahlias were selected by the Joint Dahlia Committee for trial at Wisley :—

From Messrs. Burrell, Cambridge :

'Amy' (Charm), 'Fanciful' (seedling), 'Flame' (Charm), 'Harriet' (Charm), 'Hosea' (Charm), 'Muriel' (Charm), 'Pattie' (Charm), 'Prudence' (Camellia-fld.), 'Winnifred' (Charm).

From Messrs. Cheal, Crawley :

'Mrs. A. Gordon' (Min. Pæony), 'Mrs. W. R. Dykes' (Pæony), 'Rusper Star' (Star), 'Salmon Star' (Star).

From Mr. A. J. Cobb, Reading :

'Wessex' (Min. Pæony).

From Mr. T. Hay, Hyde Park, London :

'Pink Coltness Gem' (Mignon Single).

From Messrs. Stredwick, St. Leonards-on-Sea :

'Wagtail' (Pæony).

From Messrs. Treseder, Cardiff :

'Gwendoline' (Min. Pæony), 'May' (Rosette), 'Mary Poynter' (Min. Pæony).

Other Exhibits.

Messrs. Bide, Farnham : Rose 'Phyllis Bide.'

Mr. G. L. Duncan, Radley College, Berks : Dahlias.

Mrs. Lloyd Edwards, Ruabon : *Arctotis* hybrids.

Ifield Nurseries, Crawley : *Chrysanthemum* 'Autumn Rose.'

Messrs. Jones & Ingwersen, Letchworth : *Rudbeckia* 'Letchworth Rocket.'

Mr. Shoesmith, Guildford : Dahlias.

Messrs. Simmonds, Kings Langley : Asters.

Mr. C. Turner, Slough : Dahlias.

Mr. W. Wells, jun., Merstham : Asters.

Section B.

Mr. G. W. E. LODER in the Chair, and thirteen other members present.

*Awards Recommended :—**Award of Merit.*

To *Polystichum angulare divisilobum nitescens grande* (votes unanimous), from Mr. A. Perry, Enfield. A very graceful fern with handsome fronds nearly a yard in length radiating from the centre of the plant. The specimen exhibited bore fourteen fronds. The pinnæ are very deeply serrated.

To *Potentilla dahurica manchurica* (votes unanimous), from Mr. A. Perry, Enfield. A prostrate growing shrub, the flowers of which have creamy-white, rounded petals and a bunch of golden stamens in the centre.

To *Potentilla Farreri prostrata* (votes unanimous), from Mr. A. Perry, Enfield. Another prostrate growing *Potentilla*, with bright golden-yellow flowers.

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To *Pyrus pinnatifida* (votes unanimous), from Major G. Codrington, Chipping Sodbury. A handsome hardy tree of moderate height. It has oblong leaves pinnately cut, especially towards the base, and its white sweetly scented flowers, borne in loose corymbose clusters, are followed by large highly polished oval scarlet berries.

Other Exhibits.

Messrs. Charlton, Tunbridge Wells : *Cupressus Charltonii*.
Mr. H. Hemsley, Crawley : *Cupressus Lawsoniana Hemsleyana*.
Messrs. Wallace, Tunbridge Wells : *Rosa setipoda*.

FLORAL COMMITTEE, OCTOBER 7, 1924.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and fifteen other members present.

Awards Recommended :—

Award of Merit.

To Aster 'Madame E. Besnard' (votes unanimous), from Mr. F. G. Wood, Ashtead. A French variety of the Amellus type, growing about 2 feet high. Its flowers are of a bright rosy-mauve colour.

To Aster 'Mrs. Pierpont-Morgan' (votes unanimous), from Hon. Vicary Gibbs, Elstree. A pretty variety of the Novi-Belgii section. It resulted from a cross between the varieties 'Hon. E. Gibbs' and 'The Queen.' It is very free flowering in habit, and the colour is a very pale lilac, almost white.

To Aster 'Well's Favourite' (votes unanimous), from Mr. W. Wells, jun., Merstham. A very bright rosy-mauve Aster of the Amellus type. It is a sport from 'Perry's Favourite' and was raised by the exhibitor.

To Chrysanthemum 'J. Cotton' (votes 7 for), from Mr. G. Carpenter, Byfleet. A bright reddish-chestnut variety of good form and with a golden reverse.

To Chrysanthemum 'Primrose Poiteau' (votes unanimous), from Messrs. Lowe & Shawyer, Uxbridge. A very fine pale primrose-yellow Japanese variety with broad florets.

To Chrysanthemum 'Reginald A. Roots' (votes unanimous), from Mr. W. Roots, Cranford. An excellent large white variety with slightly twisted florets.

Other Exhibits.

Messrs. Barr, Taplow : Aster 'Barr's Pink.'

Mr. A. J. Cobb, Reading : Dahlias.

Mrs. Dodd, Ockley : Dahlias.

Messrs. Johnson, Alfreton : Chrysanthemums.

The Orpington Nurseries, Orpington : Gladiolus 'Conquest.'

Mr. T. Smith, Newry : Lobelia 'Huntsman.'

Messrs. Wells, Merstham : Chrysanthemums.

The following Dahlias were selected by the Joint Dahlia Committee for trial at Wisley :—

From Messrs. Burrell, Cambridge :

'Elatior' (Min. Pæony), 'Emmeline' (Min. Pæony), 'Noella' (Min. Pæony), 'Omar' (Min. Pæony).

From Messrs. Cheal, Crawley :

'Highmead Star' (Star), 'Lady Young' (Garden Cactus), 'Petworth Star' (Star).

Section B.

Mr. W. BEAN, V.M.H., in the Chair, and thirteen other members present.

Awards Recommended :—

Award of Merit.

To *Hippeastrum solandrisiflorum* (votes unanimous), from Major Pam, Brounne. The plant exhibited was about 2 feet high and carried five flowers at the end of a stout scape. The flower is very sweetly scented and about 6 inches long, with recurving segments and a long green tube.

To *Kniphofia Nelsonii* (votes unanimous), from Mr. R. C. Notcutt, Woodbridge. This late free flowering species has small racemes of bright scarlet tubular flowers tinged with orange.

To *Primula siamensis* (votes unanimous), from the Royal Botanic Gardens, Kew. A very distinct cool greenhouse species growing about 6 inches high. It has pale green leaves with prominent veins and irregularly toothed margins. The flowers, of which the plant carried five and two buds, are pale lavender-blue. The calyces and stems are covered with white farina.

Other Exhibits.

Mrs. L. Cohen, Rickmansworth : *Ornithogalum lacteum*.

Misses Hopkinson, Shepperton : *Lathyrus sativus*.

Mrs. Philip Martineau, Sunningdale : *Scabiosa romanica* 'Crimson Velvet.'

Mr. T. Smith, Newry : *Photinia variabilis*.

W. Van de Weyer, Esq., Dorchester : *Gladiolus Cooperi*, *G. Quarterianus*.

Messrs. R. Veitch, Exeter : *Escallonia montevidensis*.

FLORAL COMMITTEE, OCTOBER 21, 1924.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and fourteen other members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Mr. E. J. Hicks, Hurst, for Roses.

To Messrs. Ladhams, Southampton, for hardy plants.

To Messrs. Luxford, Harlow, for Chrysanthemums.

Silver Banksian Medal.

To Messrs. Barr, Taplow, for Nerines.

To Messrs. Cheal, Crawley, for Dahlias.

To Messrs. House, Westbury-on-Trym, for Scabious.

To Mr. J. J. Kettle, Corfe Mullen, for Violets.

To Mr. G. Prince, Longworth, for Roses.

To Mr. G. Reuthe, Keston, for hardy plants.

To Messrs. S. Low, Enfield, for Carnations.

Bronze Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Baker, Codsall, for hardy plants.

To Messrs. Cragg, Harrison & Cragg, Heston, for Chrysanthemums.

To Messrs. Cuthbert, Southgate, for Streptocarpus.

To the Duchess of Wellington, Basingstoke, for *Nerine Bowdenii*.

To Mr. C. Engelmann, Saffron Walden, for Carnations.

To Messrs. Godfrey, Exmouth, for Chrysanthemums.

To Mr. J. H. Pemberton, Havering-atte-Bower, for Roses.

To Mr. B. Pinney, Durweston, for Violets.

To Mr. J. B. Riding, Chingford, for Dahlias.

To Mr. W. Wells, jun., Merstham, for hardy plants.

To Mr. J. T. West, Brentwood, for Dahlias.

To Mr. Yandell, Maidenhead, for Chrysanthemums.

Award of Merit.

To Carnation 'Viscountess Hambledon' (votes 6 for, 1 against), from Viscount Hambledon, Henley-on-Thames. A perpetual flowering variety of good form. It is a fancy variety with a salmon-buff ground flaked with crimson, the result of a cross between 'Benora' and 'Aviator.'

To Carnation 'Winsome Wharton' (votes unanimous), from Mr. J. R. Batty, Skelton-in-Cleveland. A perpetual flowering variety of good form and size, and possessing a very decided clove scent. The ground colour is white flushed with pink.

To Chrysanthemum 'Enid Elder' (votes 6 for, 1 against), from Messrs. Cragg, Harrison & Cragg, Heston. A new golden yellow seedling of good size.

To Chrysanthemum 'Gloriosa' (votes unanimous), from Mr. H. Shoesmith, Guildford. A large deep golden-bronze variety with broad florets.

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To Chrysanthemum 'Jean Pattison' (votes 6 for), from Messrs. Cragg, Harrison & Cragg, Heston. A medium-sized reddish-golden bronze variety.

To Chrysanthemum 'Laddie' (votes unanimous), from Mr. G. Carpenter, Byfleet. A good deep yellow single variety with several rows of florets.

To Chrysanthemum 'Miss Dorothy Wilson' (votes unanimous), from Mr. W. Roots, Cranford. A golden-yellow incurved variety of good form.

To Chrysanthemum 'Sulphur Queen' (votes unanimous), from Messrs. K. Luxford, Harlow. A very large pale sulphur-yellow Japanese variety with broad florets.

To Chrysanthemum 'The Wizard' (votes unanimous), from Messrs. Cragg, Harrison & Cragg, Heston. A very effective reddish-bronze variety of useful size. It is a sport from the variety 'Sorcerer.'

To Chrysanthemum 'White Model' (votes 11 for), from Mr. G. Carpenter, Byfleet. A large white single variety with several rows of florets.

To Nerine 'Miss E. Cator' (votes unanimous), from Col. Elwes, Colesborne. A very beautiful cerise variety of large size.

To Nerine 'Mrs. Arthur Elwes' (votes unanimous), from Col. Elwes, Colesborne. Another very beautiful variety of a delicate salmon-pink shade.

To Rose 'Phyllis Bide' (votes unanimous), from Messrs. Bide, Farnham. A very pretty climbing Polyantha variety, raised by the exhibitors as the result of a cross between 'Perle d'Or' and 'Gloire de Dijon.' It flowers on the young wood, and a very long season of flowering is claimed for it. The flowers are almost double, and are of a rose-pink colour on a golden-yellow ground.

The following Dahlia was selected for trial at Wisley :

Dahlia 'Reginald Godfrey,' sent by Messrs. Godfrey, Exmouth.

Other Exhibits.

Mr. W. G. Armstrong, Canning Town : scented Dahlias.

Messrs. Barnham & Wood, Edmonton : Chrysanthemum 'Rose Chochoch.'

Mr. T. Bones, Cheshunt : Michaelmas Daisies.

The Chalk Hill Nurseries : hardy plants.

Messrs. Cutbush, Barnet : Dahlias and Michaelmas Daisies.

Messrs. Gibson, Bedale : Verbascums and Papavers.

Misses Hopkins, Shepperton : hardy plants.

The Maytham Gardens, Rolvenden : Lobelia 'Huntsman.'

Col. H. Bedford Pim, Shrivenham : Carnation 'Miss Beryl Lambert.'

Messrs. Reamsbottom, West Drayton : Anemones.

Messrs. Rich, Bath : Michaelmas Daisies.

J. Rodda, Esq., Oxshott : seedling Chrysanthemums.

E. A. Serre, Esq., Twickenham Green : Chrysanthemums.

Lord St. Cyres, Lymington : *Schizostylis coccinea* 'Mrs. Hegarty.'

Mr. C. White, Swindon : Chrysanthemums.

Mr. F. G. Wood, Ashted : hardy plants.

Section B.

Mr. G. W. E. LODER in the Chair, and thirteen other members present.

Awards Recommended :—

Gold Medal.

To Hon. Vicary Gibbs, Elstree, for berried shrubs.

Silver Banksian Medal.

To Messrs. L. R. Russell, Richmond, for Clematis.

Bronze Banksian Medal.

To Messrs. Cheal, Crawley, for shrubs.

Award of Merit.

To *Berberis pruinosa* (votes unanimous), from the R.H.S. Gardens, Wisley. An evergreen Chinese shrub reaching a height of 5 or 6 feet. It has erect, stiff branches, furnished with stout spines, and the leaves are very thick and tough, light green and glossy with numerous small spiny teeth at the edges. The older leaves turn red in autumn. The flowers appear in June and are followed by the

small pendant fruits, which are very conspicuous by reason of the dense bluish-white bloom which covers them.

To *Pyrus alnifolia* (votes unanimous), from the Royal Botanic Gardens, Kew. A hardy deciduous tree of slender erect habit. It is a native of Japan and Corea. The leaves are bright green beneath and, as the name implies, resemble those of the Alder. The long, oval, bright red fruits, about $\frac{1}{2}$ inch long, are very attractive and are said to remain a long time on the tree.

To *Pyrus Zahlbruckneri* (votes unanimous), from the Royal Botanic Gardens, Kew. Another hardy Chinese species bearing very handsome deep crimson glossy fruits of large size. Its leaves measure about $2\frac{1}{2}$ inches long by $1\frac{1}{4}$ inch wide.

Other Exhibits.

Lord Aldenham, Ware : fruits of *Akebia quinata*.

Col. Elwes, Cheltenham : *Hippeastrum reticulatum* \times *Ackermannii*, *Senecio Clivorum*, *Monanthes polyphylla*, *Saxifraga Fortunei* Elwes' var., *Berberis Pratii* var.

Dame Alice Godman, Horsham : *Browallia* sp.

Messrs. House, Westbury-on-Trym : *Salvia Pitcheri*.

Mr. J. Klinkert, Richmond : clipped Box trees.

Sir John Ramsden, Bt., Gerrards Cross : *Rhododendron saluenense*.

Lady Beatrix Stanley, Market Harborough : *Berberis* 'Sibbertoft Coral,'

B. 'Sibbertoft Fairy,' B. 'Sibbertoft Electra.'

Lord St. Cyres, Lymington : *Schizostylis coccinea*.

FLORAL COMMITTEE, NOVEMBER 4, 1924.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and twelve other members present.

Awards Recommended :—

Gold Medal.

To Mr. H. J. Jones, Lewisham, for *Chrysanthemums*.

Silver Banksian Medal.

To Messrs. Ladhams, Southampton, for hardy plants.

To Messrs. S. Low, Enfield, for Carnations and miscellaneous greenhouse plants.

To Messrs. Luxford, Harlow, for *Chrysanthemums*.

To Mr. J. Pemberton, Havering-atte-Bower, for Roses.

To Messrs. L. R. Russell, Richmond, for stove and foliage plants.

To Mrs. Sofer Whitburn, Andover, for Begonias.

Bronze Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Mr. C. Engelmann, Saffron Walden, for Carnations.

To Mr. J. J. Kettle, Corfe Mullen, for Violets.

To Messrs. Godfrey, Exmouth, for *Chrysanthemums*.

To Mr. F. G. Wood, Ashted, for *Chrysanthemums*.

Award of Merit.

To Carnation 'Lady Hindlip' (votes unanimous), from Messrs. S. Low, Enfield. A very good fancy variety of excellent form. It is slightly scented, and the ground colour is white pencilled with red.

To *Chrysanthemum* 'Gorgeous' (votes 8 for, 2 against), from Messrs. Godfrey, Exmouth. An extra large dark crimson single variety.

To *Chrysanthemum* 'Harmony' (votes unanimous), from Mr. H. Shoesmith, Guildford. This is described as a "market" variety, and it has large flowers of excellent form. Its colour is reddish-bronze with a light gold reverse.

To *Chrysanthemum* 'Mr. T. Slack' (votes 9 for), from Messrs. Luxford, Harlow. A large light red Japanese variety with a buff reverse.

To *Chrysanthemum* 'Sheila' (votes 8 for, 1 against), from Messrs. Luxford, Harlow. A medium-sized dark crimson single variety with several rows of florets.

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To Chrysanthemum 'Sunburst' (votes unanimous), from Mr. H. Shoesmith, Guildford. Another "market" variety of excellent form and good substance. It is of a pleasing salmon-buff colour with a pale gold reverse.

To Chrysanthemum 'Thomas W. Pockett' (votes unanimous), from Messrs. Luxford, Harlow. A large rosy-pink Japanese variety with a silvery reverse. Its florets are broad and curled.

Other Exhibits.

Mr. G. Carpenter, Byfleet: Chrysanthemums.
Messrs. Carter, Raynes Park: *Rivina humilis*.
Mr. F. H. Cooke, Gosberton: Chrysanthemums.
Major Dalgety, Romsey: Chrysanthemums.
Mr. Klinkert, Richmond: clipped Box trees.
Mr. B. Pinney, Durweston: Violets.
Messrs. Reamsbottom, West Drayton: Anemones.
Mr. W. Stevens, Hoddesdon: Rose 'Roselandia.'
Mr. W. H. Tyzack, High Wycombe: Chrysanthemums.

Section B.

Mr. G. W. E. LODER in the Chair, and fourteen other members present.

Awards Recommended:—

Silver-gilt Banksian Medal.

To W. B. Cranfield, Esq., Enfield Chase, for hardy ferns.

Silver Banksian Medal.

To Messrs. Russell, Richmond, for Clematis.

To Messrs. Waterer, Sons & Crisp, Twyford, for berried shrubs.

First-class Certificate.

To *Callicarpa Givaldiana* (votes unanimous), from Messrs. Waterer, Sons & Crisp, Twyford. A deciduous Chinese shrub growing from 5 to 6 feet high and probably the most attractive species of this genus. The wood is of a light brown colour. The chief beauty of the plant lies in its numerous small panicles of tiny lilac-purple berries. The wide lanceolate leaves measure from 3 to 5 inches long and from 1 to 2½ inches wide.

Award of Merit.

To *Billardiera longiflora* (votes unanimous), from Col. Stephenson Clarke, Cuckfield. A climbing evergreen shrub introduced from Tasmania in 1810. It has slender, smooth stems and narrow lanceolate entire leaves from 1 to 1½ inch long. The solitary oblong-globular fruits are of a beautiful dark violet-purple colour. This plant is unfortunately rather tender and can only be grown successfully out of doors in the more favoured parts of the country.

To *Coloneaster glaucophylla* (of Franchet) (votes unanimous), from C. Eley, Esq., East Bergholt. A Chinese shrub of spreading and quick growing habit. It has ovate glabrous leaves measuring 1½ inch long, dark green above and lighter green below. The plant is very freely furnished with bunches of scarlet berries as large as culinary peas. The flowers, which appear in May, are white and of good size.

To *Dianella tasmanica* (votes unanimous), from Col. Stephenson Clarke, Cuckfield. A tender perennial rhizomatous plant, growing from 4 to 5 feet high and having long dark green ensiform leaves. The flowers are nodding and pale blue. They are succeeded by very striking dark violet fruits measuring nearly 1 inch long.

To *Lonicera ligustrina yunnanensis* (votes unanimous), from Col. Stephenson Clarke, Cuckfield. An evergreen Chinese shrub with foliage resembling that of *L. nitida*. Its clusters of small black berries borne close to the stem render it very attractive in the autumn.

To *Polystichum angulare divisilobum laxum* (votes unanimous), from W. B. Cranfield, Esq., Enfield Chase. This handsome hardy fern, which was raised by the exhibitor, is a marked advance on the parent plant. The long fronds are finely divided and of a dark green colour. The whole plant has a delicate feathery appearance which is very pleasing.

To *Polystichum angulare falcatum* Cranfield No. 1 (votes unanimous), from W. B. Cranfield, Esq., Enfield Chase. Another handsome hardy fern representing the third generation from the normal. It was raised by the exhibitor from *P. angulare falcato-tripinnatum*, which was raised from *P. angulare* Moly's variety, a wild find. Its very graceful, finely divided light green fronds radiate from the centre of the plant and are about 2 feet long, bending slightly towards the top.

Other Exhibit.

Misses Hopkins, Shepperton : hardy plants.

FLORAL COMMITTEE, NOVEMBER 18, 1924.

Section A:

Mr. H. B. MAY, V.M.H., in the Chair, and ten other members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To the French Intensive Gardens, Croydon, for everlasting flowers and grasses.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Cragg, Harrison & Cragg, Heston, for Chrysanthemums.

To Messrs. Luxford, Harlow, for Chrysanthemums.

To Messrs. S. Low, Bush Hill Park, for Carnations and other greenhouse plants.

To Messrs. Wells, Merstham, for Chrysanthemums.

To Mr. A. G. Vinten, Balcombe, for Chrysanthemums.

Bronze Banksian Medal.

To Mr. C. Engelmann, Saffron Walden, for Carnations.

To Miss E. Heathcote, Williton, for Violets.

To Mr. J. J. Kettle, Corfe Mullen, for Violets.

Award of Merit.

To Carnation 'Anne Corry' (votes unanimous), from Mr. G. Carpenter, Byfleet. An excellent perpetual-flowering variety raised by the exhibitor. The flowers are scented and of very good form. They measure $3\frac{1}{2}$ inches across and are of a dark rich crimson colour. The plant appears to be a strong and vigorous grower.

To Chrysanthemum 'Aldyth' (votes 7 for), from Messrs. Cragg, Harrison & Cragg, Heston. A good Decorative seedling raised by the exhibitors. The flowers are of a rich reddish-crimson colour with a pale buff reverse.

To Chrysanthemum 'Annette' (votes 5 for), from Messrs. Cragg, Harrison & Cragg, Heston. A single variety with several rows of florets. The ground colour is yellow streaked with golden-bronze, and there is a wide yellow zone round the centre.

To Chrysanthemum 'Challenger' (votes 7 for), from Mr. J. Barrell, Bridgewater. This excellent single variety is probably the nearest approach to scarlet we have in Chrysanthemums at the present time. It has flat rich red florets with a buff reverse, and there is a narrow yellow zone round the centre.

To Chrysanthemum 'Envy' (votes 7 for), from Mr. J. Barrell, Bridgewater. A large bright reddish-crimson single variety with a gold reverse, and a yellow band surrounding the rather small disc. The florets are slightly recurved and pointed at the tips.

To Chrysanthemum 'Lynette' (votes 6 for), from Messrs. Cragg, Harrison & Cragg, Heston. A large white Decorative variety with broad florets.

To Chrysanthemum 'Mr. J. Barrell' (votes 5 for), from Messrs. Luxford, Harlow. A medium-sized bright chestnut-red single variety having the disc surrounded by a zone of yellow and the florets slightly recurved.

To Chrysanthemum 'Mrs. R. Jinks' (votes unanimous), from Mr. W. Jinks, Upper Tooting. A delicate pale salmon single variety with pale yellow band surrounding the centre. The florets of this variety are very narrow.

To Chrysanthemum 'Sportsman' (votes 6 for), from Mr. H. Shoesmith, Guildford. A pale reddish-salmon single variety with several rows of florets.

Other Exhibits.

- Mr. I. Barker, Blackburn : Chrysanthemum 'Mrs. J. W. Stones.'
Mr. F. Billingham, Anerley : Chrysanthemums.
G. W. W. Blathwayt, Esq., West Porlock : *Schizostylis coccinea* 'Mrs. Hegarty,' raised true from seed.
Messrs. H. Chapman, Rye : Nerine 'Rose Dorée.'
Messrs. C. Elliott, Stevenage : *Schizostylis coccinea* 'Mrs. Hegarty.'
Lt.-Col. E. G. Evans, Tiverton : Carnations 'Pink Lavender' and 'Purple Lavender.'
Mr. E. Jones, Chepstow : Chrysanthemum 'Zulu.'
Mr. A. Petchey, Bishop's Stortford : seedling Chrysanthemum.
Mr. B. Pinney, Durweston : Violets.
Mr. W. Stevens, Hoddesdon : Rose 'Roselandia.'
Mr. F. G. Wood, Ashted : Chrysanthemums.
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Section B.

Mr. G. W. E. LODER in the Chair, and thirteen other members present.

Award Recommended :—

Bronze Banksian Medal.

To Messrs. Whitelegg, Chislehurst, for shrubs.

Other Exhibits.

- G. W. W. Blathwayt, Esq., West Porlock : *Bomarea Wercklei*.
Messrs. C. Elliott, Stevenage : *Gentiana sino-ornata*.
Misses Hopkins, Shepperton : hardy plants.
Mr. J. Klinkert, Richmond : clipped Box trees.
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FLORAL COMMITTEE, DECEMBER 2, 1924.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and twelve other members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. S. Low, Bush Hill Park, for Carnations and other greenhouse plants.

To Messrs. Luxford, Harlow, for Chrysanthemums.

To Major Pam, Broxbourne, for Begonias.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Cragg, Harrison & Cragg, Heston, for Chrysanthemums.

To Mr. C. Engelmann, Saffron Walden, for Carnations.

To Mr. J. W. Forsyth, Putteridge, for Cyclamen.

To Mr. A. G. Vinten, Balcombe, for Chrysanthemums.

Bronze Banksian Medal.

To Mr. J. J. Kettle, Corfe Mullen, for Violets.

Award of Merit.

To Carnation 'Doris Cox' (votes 8 for), from Mr. G. Carpenter, Byfleet. A lilac-mauve perpetual-flowering variety raised from seed by the exhibitor in 1921. The plant is of good bushy habit.

To Carnation 'Janet' (votes unanimous), from Mr. C. Engelmann, Saffron Walden. A perpetual-flowering variety raised by the exhibitor. Its flowers are of good form and of a bright rosy-carmine colour.

Other Exhibits.

Messrs. Godfrey, Exmouth : Chrysanthemums.
 Mr. C. Gray, Cobham : Carnation 'Mrs. A. B. Gill.'
 Mr. H. G. Newton, Bristol : Chrysanthemum 'Mrs. H. G. Newton.'
 Mr. J. E. Palmer, Tarporley : Chrysanthemums.
 Mr. B. Pinney, Durweston : Violets.
 Messrs. Reamsbottom, West Drayton : Anemones.
 Mr. J. P. Thorne, Weybridge : Chrysanthemum 'Honeysuckle.'
 Mr. A. Young, Oxted : Chrysanthemum 'Sunshine Willcox.'

Section B.

Mr. G. W. E. LODER in the Chair, and thirteen other members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Mr. G. Reuthe, Keston, for collection of conifers.

Silver Banksian Medal.

To Mr. S. Smith, Enfield, for Cacti.

Bronze Banksian Medal.

To Mr. H. Hemsley, Crawley, for shrubs.

Award of Merit.

To *Rhamnus erythroxylon* (votes unanimous), from Hon. Vicary Gibbs, Elstree. This beautiful Buckthorn comes from Eastern Siberia and Northern Mongolia. It is much branched, and at this season of the year very freely furnished with short-stalked black berries of good size.

Other Exhibits.

Mr. J. Graef, Olivet-Orleans, France : Mistletoe in pots.
 Mr. Klinkert, Richmond : clipped Box trees.
 R.H.S. Gardens, Wisley : *Cotoneaster lactea*.
 Mr. W. Wells, jun., Merstham : shrubs and alpine.

FLORAL COMMITTEE, DECEMBER 16, 1924.

Section A.

Mr. H. B. MAY, V.M.H., in the Chair, and twelve other members present.

Awards Recommended :—

Gold Medal.

To Baron Schröder, Englefield Green, for Begonias.

Silver Banksian Medal.

To Mr. J. W. Forsyth, Putteridge, for Chrysanthemums.

To Messrs. S. Low, Bush Hill Park, for Carnations and other greenhouse plants.

To Mr. A. Shambrook, Aylesbury, for Cyclamen.

Bronze Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Mr. C. Engelmann, Saffron Walden, for Carnations.

To Miss Heathcote, Williton, for Violets.

Award of Merit.

To Chrysanthemum 'Balcombe Beauty' (votes unanimous), from Mr. A. G. Vinten, Balcombe. A bright golden-yellow Decorative variety of nice form and medium size. It is a sport from 'December Bronze.'

To Rose 'Columbia' (votes unanimous), from Mr. C. Engelmann, Saffron Walden. A good H.T. variety raised by Messrs. E. G. Hill, of Richmond, Indiana, U.S.A. The flowers are of excellent form, very sweetly scented and of a good deep pink colour. The blooms exhibited on this occasion had been grown on the American system, and were shown on stems 4 feet to 5 feet long, thus demonstrating the great value of this variety as a forcing Rose.

Other Exhibits.

The Misses Hopkins, Shepperton : hardy plants.
Kingsley Nursery, Bordon : Chrysanthemums.
Messrs. Luxford, Harlow : Chrysanthemum 'Stephanie.'
Mr. B. Pinney, Durweston : Violets.
Mr. F. G. Wood, Ashted : Chrysanthemums.

Section B.

Mr. G. W. E. LODER in the Chair, and twelve other members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Hon. Vicary Gibbs, Elstree, for a collection of Hollies.

Silver Banksian Medal.

To the Orpington Nurseries, Orpington, for conifers and shrubs.

Bronze Banksian Medal.

To Messrs. Baker, Codsall, for shrubs and Primroses.

To Miss Gladys Howse, Golders Green, for miniature gardens.

Award of Merit.

To *Colchicum libanoticum* (votes unanimous), from E. M. Preston, Esq., Hayes. This interesting plant, which was flowered by the exhibitor out-of-doors, is a native of Syria. Its white flowers of medium size, borne in bunches varying from 2 to 8, arise from the short thick sheath of leaves which at the time of flowering are half as long as the perianth tube, broadly lanceolate, and about one inch wide.

To *Crataegus Carrièrei* (votes unanimous), from Hon. Vicary Gibbs, Elstree. A small tree with spreading branches and stout spines. Its comparatively large fruits are ovoid in shape and of a pleasing reddish-bronze colour. The origin of this plant is not quite certain, but it has been suggested that it is probably a hybrid between *C. Crus-galli* and *C. mexicana*.

Other Exhibits.

Col. Stephenson Clarke, Cuckfield : *Cotoneaster lactea* and *C. 17388 F.*
Mr. F. G. Wood, Ashted : miniature rock gardens.

ORCHID COMMITTEE.

JULY 8, 1924.

Sir JEREMIAH COLMAN, Bt., in the Chair, and fourteen other members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Stuart Low, for species and hybrids.

Bronze Banksian Medal.

To Messrs. Sanders, for various Orchids.

Award of Merit.

To *Vuylistekeara* × 'Edna' var. 'Normandy' (*Miltoniodes Harwoodii* × *Odontioda Charlesworthii*) (votes 12 for, 2 against), from Messrs. Charlesworth. An improved form of this trigenetic hybrid, the branched spike bore 31 flowers of reddish-scarlet colour.

ORCHID COMMITTEE, JULY 22, 1924.

Sir JEREMIAH COLMAN, Bt., in the Chair, and eleven other members present.

Awards Recommended :—

Silver Banksian Medal.

To H. T. Pitt, Esq., for rare species.

To Messrs. Stuart Low, for various Orchids.

Award of Merit.

To *Miltonia* × 'Constance' var. *Regina (vexillaria* × 'Isabel Sander') (votes unanimous), from H. T. Pitt, Esq., Stamford Hill. Resembling the *vexillaria* parent in habit, but of much deeper rose colour.

Cultural Commendation.

To Mr. Thurgood, gardener to H. T. Pitt, Esq., for a well-grown plant of *Miltonia Phalaenopsis* with 16 flowers.

To Mr. Kent, gardener to E. R. Ashton, Esq., Camden Park, Tunbridge Wells, for a fine example of *Promenaea xanthina* with 70 flowers.

ORCHID COMMITTEE, AUGUST 12, 1924.

C. J. LUCAS, Esq., in the Chair, and twelve other members present.

Awards Recommended :—

Silver Banksian Medal.

To H. T. Pitt, Esq., for group of species.

To Messrs. Stuart Low, for exhibit of hybrids.

Award of Merit.

To *Odontonia* × *Joiceyi* (*Odontonia* × *Pittia* × *Odontoglossum* × 'Tityus') (votes 7 for, 3 against), from Messrs. Charlesworth. This immature plant had the sepals and petals heavily marked with rose-purple, the expansive labellum of deeper colour, and with reddish lines around the crest.

Other Exhibit.

Messrs. Cowan : various Cattleyas and Laeliocattleyas.

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ORCHID COMMITTEE, AUGUST 26, 1924.

C. J. LUCAS, Esq., in the Chair, and eleven other members present.

Awards Recommended :—

Silver Banksian Medal.

To H. T. Pitt, Esq., Rosslyn, Stamford Hill, for group of rare species and interesting hybrids.

First-class Certificate.

To *Cattleya* × 'Tagus' var. 'Excelsior' ('Rhoda' × 'King George') (votes 10 for, 2 against), from Messrs. Flory & Black. An advance towards the large-flowered yellow *Cattleya*. Sepals and petals rich canary yellow, the roundly formed labellum velvety crimson.

Award of Merit.

To *Laeliocattleya* × 'Mrs. T. Ward' var. *majestica* (L.-c. × 'Hiawatha' × L.-c. × 'Lustre') (votes 9 for), from Messrs. Cowan. A large flower with the well-formed segments of purple-rose colour, the expansive labellum deep purple, extending to the margin of the side lobes.

To *Laeliocattleya* × 'Profusion' var. *compacta* (L.-c. × 'Serbia' × C. × *Hardyana*) (votes 5 for), from Messrs. J. & A. McBean. A fine example of this hybrid, and noted for its profuse flowering quality.

Cultural Commendation.

To Mr. Thurgood, Orchid-grower to H. T. Pitt, Esq., for a finely cultivated plant of *Maxillaria venusta*, bearing nine flowers.

Other Exhibits.

Messrs. Sanders: *Megacalinium triste*, *Stanhopea insignis aurea*, and *Bulbophyllum macrobulbon*.

Dr. Miguel Lacroze: *Laeliocattleya* × *Colmaniana* 'Bryndir' var., and L.-c. × 'Momus' 'Bryndir' var.

Geo. Wm. Bird, Esq.: *Brassocattleya* × 'Andromeda' (C. *armainvillierensis* × B.-c. *Digbyano-Warneri*), with large flowers of rose-pink colour.

Messrs. Flory & Black: *Laeliocattleya* × 'Fantasia' (L.-c. 'Thyone' × C. 'Triumphans'), cream coloured, the labellum rose-purple.

ORCHID COMMITTEE, SEPTEMBER 9, 1924.

Sir JEREMIAH COLMAN, Bt., in the Chair, and twelve other members present.

Awards Recommended :—

Silver-gilt Medal.

To R. Gerrish, Esq., Milford Manor, Salisbury, for a group of various hybrids.

Silver Banksian Medal.

To H. T. Pitt, Esq., Stamford Hill, for a group of rare species and hybrids.

Award of Merit.

To *Cattleya* × 'Joyce Hanmer' (parentage unrecorded) (votes 11 for), from R. Gerrish, Esq., Milford Manor, Salisbury. Flower of medium size, bright canary yellow colour, labellum of deeper tint and bordered with soft crimson.

To *Sophrolaeliocattleya* × 'Isabella' var. 'Vivid' (S.-l.-c. × 'Marathon' × C. × 'Fabia') (votes 13 for), from H. T. Pitt, Esq., Rosslyn, Stamford Hill. Flowers large, of buff-rose tint, the roundish labellum ruby-crimson, with the central area of lighter colour.

To *Odontioda* × 'Juanita' (*Oda.* × *Brewii* × *Odm.* × 'Pharos') (votes unanimous), from R. Gerrish, Esq., Milford Manor, Salisbury. The erect spike bore six flowers of chocolate-red colour, the labellum having an overtint of crimson and a bright sheen.

To *Brassolaeliocattleya* × 'J. M. Black' (L.-c. × *Firminii* × B.-l.-c. × 'The Baroness') (votes unanimous), from Messrs. Flory & Black. Of rich buttercup yellow colour, sepals dotted with red on the exterior, the labellum having the central area suffused with ruby-crimson.

To *Laeliocattleya* × 'Vega' (*L.-c.* × 'Rubens' × *L.-c.* × 'Soulange') (votes 12 for), from Messrs. J. & A. McBean. A finely formed flower of purplish-rose colour, the labellum darker and with the margin crisped.

Other Exhibits.

Messrs. Sanders: various species and hybrids.

Sir Jeremiah Colman, Bt.: rare species.

Messrs. Stuart Low: several hybrids.

Messrs. J. & A. McBean: *Laeliocattleya* × 'Profusion' var. 'Celtic.'

ORCHID COMMITTEE, SEPTEMBER 23, 1924.

Sir JEREMIAH COLMAN, Bt., in the Chair, and sixteen other members present

Awards Recommended:—

Gold Medal.

To Messrs. Stuart Low, for a group of species and hybrids.

To Messrs. Sanders, for a group of species and hybrids.

Silver-gilt Medal.

To Messrs. Charlesworth, for hybrids.

To Messrs. Flory & Black, for a group of Cattleyas.

Award of Merit.

To *Laeliocattleya* × 'Marina' var. 'Milo' (*C. Hardyana* × *L.-c.* × 'St. Gothard') (votes 6 for, 3 against), from Messrs. Stuart Low. Flowers large, of soft magenta-rose, labellum ruby-crimson with gold veining in the throat.

To *Brassocattleya* × *Dietrichiana*, Lambeau's var. (*B.-c.* × 'Mrs. J. Lee-mann' × *C.* × 'Fabia') (votes 11 for, 2 against), from Messrs. Stuart Low. Probably the darkest form seen in a *Brassavola* hybrid. Of deep crimson-purple colour, the labellum more intense, and fringed at the margin.

Other Exhibits.

Messrs. Armstrong & Brown: *Cattleya* × *amabilis*, with pure-white sepals and petals.

H. T. Pitt, Esq.: *Sophrolaeliocattleya* × 'Isabella' var. 'Dainty Duchess.'

Baron Bruno Schröder: *Cattleya* × 'Heliodor' ('Iridescent' × 'Venus'), of large size and bright yellow colour.

ORCHID COMMITTEE, OCTOBER 7, 1924.

Sir JEREMIAH COLMAN, Bt., in the Chair, and sixteen other members present.

Awards Recommended:—

First-class Certificate.

To *Laeliocattleya* × 'Sargon' var. 'Gloriosa' (*L.-c.* × 'Lustre' × *C.* × *Hardyana*) (votes 15 for), from Lieut.-Col. Sir George Holford, K.C.V.O., Westonbirt, Tetbury, Glos. A robust plant bearing a spike of four immense flowers, each measuring nine inches across, the petals four inches broad; o rosy-mauve colour, the broadly shaped labellum ruby-crimson.

To *Laeliocattleya* × 'Profusion' var. 'Arabic' (*L.-c.* × 'Serbia' × *C.* × *Hardyana*) (votes 10 for, 3 against), from Messrs. McBean, Cooksbridge, Sussex. The spike bore four flowers, with the segments compactly arranged, of mauve-pink colour, the labellum ruby-purple and crisped at the margin.

Other Exhibits.

Messrs. Sanders, St. Albans: various *Oncidium*s.

Messrs. Stuart Low: the new *Brassolaeliocattleya* 'C. W. Matthes' (*B.-l.-c.* × 'The Baroness' × *C.* × 'Maggie Raphael' *alba*).

Messrs. Flory & Black: various *Laeliocattleya*s.

ORCHID COMMITTEE, OCTOBER 21, 1924.

Sir JEREMIAH COLMAN, Bt., in the Chair, and eighteen other members present.

Awards Recommended :—

Baron Schröder Challenge Cup.

To Lieut.-Col. Sir George Holford, K.C.V.O., Westonbirt, Tetbury, Glos, for splendid group of Orchids.

Gold Medal.

To Messrs. J. & A. McBean, Cooksbridge, Sussex, for large group of species and hybrids.

To Messrs. Sanders, St. Albans, for large group of species and hybrids.

Silver-gilt Lindley Medal.

To Mr. H. G. Alexander, Orchid-grower to Lieut.-Col. Sir Geo. Holford, for skilful cultivation.

Challenge Cup.

To J. J. Joicey, Esq., The Hill, Witley, Surrey, for fine group of Orchids.

Silver-gilt Banksian Medal.

To H. T. Pitt, Esq., Rosslyn, Stamford Hill, for group of species and hybrids.

To Sir Jeremiah Colman, Bt., Gatton Park, Surrey, for exhibit of species and hybrids.

To Messrs. Cowan, Southgate, for group of various Orchids.

To Messrs. Stuart Low, Jarvisbrook, Sussex, for exhibit of species and hybrids.

Silver Banksian Medal.

To Messrs. Cypher & Sons, Cheltenham, for group of Orchids.

Bronze Banksian Medal.

To Mr. Harry Dixon, Wandsworth Common, for group of Orchids.

To Leonard Dixon, Esq., Pitlochrie, St. Albans, for exhibit of Orchids.

First-class Certificate.

To *Laeliocattleya* × 'Queen Mary' var. 'Colossal' (*C.* × *Peetersii* × *L.-c.* × 'Lustre') (votes unanimous), from Lieut.-Col. Sir Geo. Holford. Flowers very large, of soft purplish-rose colour, labellum crisped at the margin, and of deep purple colour.

To *Laeliocattleya* × 'Queen Mary' Westonbirt var. (votes 11 for), from Lieut.-Col. Sir Geo. Holford. The spike carried three finely developed flowers of rosy-mauve colour, the broadly formed labellum crimson-purple.

Award of Merit.

To *Laeliocattleya* × 'Queen Mary' var. 'Gloriosa' (votes unanimous), from Lieut.-Col. Sir Geo. Holford. Deep rose-purple, the expansive labellum dark crimson-purple and with a yellowish disc on each of the side lobes.

To *Laeliocattleya* × 'Golden Light' Westonbirt var. (*L.-c.* 'Golden Fleece' × *L.-c. luminosa aurea*) (votes 17 for), from Lieut.-Col. Sir Geo. Holford. A vigorous plant with an erect spike of four large flowers, segments rather narrow, but rendered attractive by their bright yellow colour; side lobes of labellum tinged with crimson.

To *Cattleya* × 'Clive' var. *ardentissima* ('Adula' × 'Iris') (votes 13 for), from Messrs. Sanders. Segments of flower erect, broadly formed, and with petals of mahogany-red colour, labellum rich purple.

To *Laeliocattleya* × 'Linda' var. *superba* (*C. aurea* × *L.-c.* × 'Arachne') (votes 15 for), from J. J. Joicey, Esq., Witley, Surrey. Flower of large size and of a peculiar bronze-rose colour; labellum rosy-purple, stained with crimson.

To *Odontonia* × *Stelpee* var. *maculata* (*M. Bleuana* × *O. Harwoodii*) (votes 12 for), from H. T. Pitt, Esq., Stamford Hill. Large flower, segments rather narrow, of yellow colour, spotted with red-brown.

To *Brassolaeliocattleya* × 'Alfred Mollet' var. 'Vivid' (*B.-l.-c.* × 'Morna' × *C. Hardyana*) (votes 13 for), from H. T. Pitt, Esq., Stamford Hill. Flowers prettily formed, sepals and petals purplish, the large labellum deep purple.

To *Cattleya* × 'Pyramus' var. 'Colossus' (*L.-c.* × 'St. Gothard' × *C. Thurgoodiana* (votes 10 for), from H. T. Pitt, Esq., Stamford Hill. Flower well formed, of large size and effectively coloured.

To *Laeliocattleya* × 'Nanon' var. 'Zebra' (*L.-c.* × 'Ivanhoe' × *C. aurea*) (votes 14 for), from J. J. Bolton, Esq., Claygate, Surrey. An unusual result in which the petals have the larger part of their area stained with bright purple.

To *Odontoglossum* × *majesticum* var. 'Admiration' (*percutum* × *eximium*) (votes 17 for), from Messrs. J. & A. McBean, Cooksbridge, Sussex. Flowers of thick substance, blotched with rose-purple.

Other Exhibits.

Sir Herbert S. Leon, Bt., Bletchley Park: *Cypripedium* × 'J. T. Barker' ('Shogun' × *San-Actaeus*).

Messrs. Armstrong & Brown: *Odontoglossum* × *Armstrongii*, with lemon-yellow blotching on the sepals and petals. Also various *Cattleyas* and a fine specimen of *Vanda luzonica*.

ORCHID COMMITTEE, NOVEMBER 4, 1924.

C. J. LUCAS, Esq., in the Chair, and twelve other members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Cowan, Southgate, for group of *Cattleyas*.

To Messrs. Stuart Low, Jarvisbrook, Sussex, for *Cattleyas* and *Cypripediums*.

First-class Certificate.

To *Vuykstekeara* × 'Aspasia' var. *polysticta* (*Oda* × *Charlesworthii* × *Miltonia Charlesworthii*) (votes unanimous), from Messrs. Charlesworth. In habit resembling *M. vexillaria*; sepals and petals crimson-red, the rose-tinted labellum having a crimson blotch at the base and profusely spotted with rose-purple.

To *Laeliocattleya* × 'Lustrissima,' Westonbirt var. (*C. Warscewiczii* × *L.-c.* × 'Lustre') (votes unanimous), from Lt.-Col. Sir George Holford, K.C.V.O. Flowers large, eight inches in width, segments well proportioned, of rosy-mauve colour, the roundly formed labellum of purple colour heavily tinged with crimson.

Award of Merit.

To *Miltonia* × 'Beau Brummell' var. 'Aureole' ('Venus' × *Bleuana*) (votes unanimous), from Messrs. Charlesworth. A pretty flower, bluish-tinted, petals tinged with rose-purple, the expansive labellum having a crimson mask at the base and with radiating lines of similar colour.

To *Laeliocattleya* × *Hassallii* var. 'Supreme' (*L.-c.* × *Britannia* × *C. Warscewiczii*) (votes 6 for, 2 against), from Messrs. J. & A. McBean, Cooksbridge, Sussex. The broadly developed segments of thick texture, pure-white, except for the bright Tyrian-purple colour on the labellum.

To *Cattleya* × 'Wembley' (*Peetersii* × *Alexandra*) (votes unanimous), from Messrs. Flory & Black, Slough. A richly coloured hybrid; sepals and petals tinged with crimson, labellum ruby-crimson, and with an orange throat.

Other Exhibits.

Messrs. J. & A. McBean: various hybrids.

Leonard Dixon, Esq., Pitlochrie, St. Albans: *Cattleya* × 'Mrs. Gratrix' var. 'My Queen' ('Lady Veitch' × *intertexta*), pure white.

ORCHID COMMITTEE, NOVEMBER 18, 1924.

Sir JEREMIAH COLMAN, Bt., in the Chair, and fourteen other members present.

Awards Recommended :—

Bronze Banksian Medal.

To Messrs. Stuart Low, Jarvisbrook, Sussex, for *Cattleyas* and *Laeliocattleyas*.

To Messrs. Cowan, Southgate, for *Cypripediums* and *Cattleyas*.

First-class Certificate.

To *Miltonia* × 'William Pitt' var. *atropurpurea* ('Isabel Sander' × *Bleuana* var. 'Reine Elizabeth') (votes unanimous), from Messrs. Charlesworth, Haywards Heath. Sepals and petals intense crimson-purple, labellum slightly less intense, the base having a white area with ray-like markings. Probably the finest form of the *M. vexillaria* section yet seen.

Award of Merit.

To *Miltoniodes* × 'Boadicea' (*Miltoniodes* × *Harwoodii* × *Miltonia vexillaria* var. 'Lyoth') (votes 6 for, 2 against), from Messrs. Charlesworth. Sepals and petals of deep crimson colour, labellum a little lighter.

To *Odontonia* × *regalis* (*M. vexillaria* var. 'Queen Alexandra' × *O.* × 'Aquitania') (votes 8 for, 2 against), from Messrs. Charlesworth. Segments widely developed, white, with rose-flushed areas, and slightly marked with blackish spots.

Other Exhibits.

Lt.-Col. Sir George Holford, K.C.V.O.: *Cypripedium* × 'Imperator,' Westonbirt var., with the dorsal sepal rose-tinted and evenly dotted with purple-brown. Also *Cypripedium* × 'Madame Fevrier' var. *pulcherrimum*, with the dorsal sepal greenish, bordered with white, and densely spotted with blackish-purple.

Messrs. Flory & Black: *Brassocattleya* × *Fabia* (*C. Fabia* × *B.-c.* × *Massangeana*), large, and of rosy-mauve colour.

Messrs. Charlesworth: *Odontoglossum* × 'Rêve d'Or' ('Boadicea' *aureum* × *harvengtense aureum*), flowers yellow, blotched with a deeper tint.

ORCHID COMMITTEE, DECEMBER 2, 1924.

C. J. LUCAS, Esq., in the Chair, and nineteen other members present.

Awards Recommended:—

Gold Medal.

To G. F. Moore, Esq., Chardwar, Bourton-on-the-Water, Gloucestershire, for a group of magnificent *Cypripediums*.

Silver-gilt Banksian Medal.

To Robert Paterson, Esq., Stamperland, Glasgow, for group of over sixty *Cypripediums*.

To H. T. Pitt, Esq., Rosslyn, Stamford Hill, for exhibit of interesting Orchids.

To Messrs. Sanders, St. Albans, for group of species and hybrids.

To Messrs. J. Cypher & Sons, Cheltenham, for group of *Cypripediums*.

Silver Banksian Medal.

To Messrs. Cowan, Southgate, N., for *Cypripediums* and *Cattleya* hybrids.

To Messrs. Stuart Low, Jarvisbrook, Sussex, for group of species and hybrids.

To Messrs. J. & A. McBean, Cooksbridge, Sussex, for *Cypripediums* and *Odontoglossums*.

To A. J. Hollington, Esq., Enfield, for group of *Cypripediums*.

Bronze Banksian Medal.

To Sir Arthur Watson, Finchley, for group of *Cypripedium* species and hybrids.

First-class Certificate.

To *Cypripedium* × 'Crusader,' Westonbirt var. ('Lucifer' × 'Julian') (votes unanimous), from Lieut.-Col. Sir George Holford, K.C.V.O. Size and colour are fully represented in this hybrid. The roundly formed dorsal sepal heavily stained with crimson-purple, except for the upper part, which is white; petals and labellum yellowish, tinged with mahogany colour.

To *Brassocattleya* × 'British Queen' var. *splendens* (*B.-c.* × *Digbyano-Mendelii* × *C.* × 'Lord Rothschild') (votes unanimous), from Messrs. Cowan, Southgate. Flower of immense size and of rose-pink colour, the fringed labellum deep rose colour on the front and side lobes, the throat yellowish.

To *Cypripedium* × 'Cappamagna' var. 'Fred Sander' ('Cardinal Mercier' × 'Nubia') (votes unanimous), from Messrs. Sanders, St. Albans. A well-proportioned flower, rendered specially attractive by the rich purplish colouring on the large dorsal sepal.

To *Cypripedium* × 'Doris Stanton' ('Goliath' × 'Pyramus' *magnificum*) (votes unanimous), from G. F. Moore, Esq., Chardwar, Bourton-on-the-Water, Gloucestershire. One of the largest of *Cypripediums*, the dorsal sepal flushed with rose on the lower half, the upper part white; petals and labellum broadly developed, brownish-yellow, tinged with purple.

Award of Merit.

To *Odontonia* × 'Alexandra' (*Odontonia* × 'Merope' × *Odontoglossum* × 'Crethus') (votes unanimous), from Messrs. Charlesworth, Haywards Heath. A further step in the production of a warm-growing *Odontoglossum*. Sepals and petals blotched and spotted with purple, the broad labellum having a dark red base and yellow crest.

To *Odontonia* × 'Olivia' var. 'Princess' (*M. Bleuana* × *O. triumphans*) (votes unanimous), from Messrs. Charlesworth, Haywards Heath. An improvement on the original form, flowers of golden colour and with dark brown blotchings.

To *Cypripedium* × 'Our Prince' ('Goliath' × 'Tommy Curte') (votes unanimous), from Robert Paterson, Esq., Stamperland, Glasgow. A large flower, the dorsal sepal effectively marked with dark purple spotting, the labellum honey-yellow tinged with red-brown.

To *Cypripedium* × 'Odin' ('Antinous' × *miens-Leeanum* var. *Becktoniae*) (votes unanimous), from Robert Paterson, Esq., Stamperland, Glasgow. Large greenish flower, dorsal sepal almost all white, greenish base, and with slight spotting on median area.

To *Cypripedium* × 'Mildred' var. 'Mrs. Stephen Anderson' (*bourtonense* × 'Christopher' var. 'Grand Duke Nicholas') (votes 11 for, 4 against), from G. F. Moore, Esq., Chardwar, Bourton-on-the-Water, Gloucestershire. Flower of light greenish colour, the immense dorsal sepal having the upper part white, the ventral sepal almost as large and similarly coloured.

Other Exhibits.

Baron Bruno Schröder, Englefield Green, Surrey: cut spikes of *Calanthe Harrisii*, with nearly forty large white flowers on each.

Lieut.-Col. Sir George Holford, K.C.V.O.: *Cypripedium* × 'Moonlight' ('Actaeus Bianca' × 'Moonbeam'), dorsal sepal white, green at the base, petals and labellum greenish-yellow.

Messrs. Charlesworth: *Odontonia* × 'Merope' var. 'Dainty' and *Odontonia* × 'Milly' (*M. Bleuana* × *O. percultum*).

ORCHID COMMITTEE, DECEMBER 16, 1924.

C. J. LUCAS, Esq., in the Chair, and sixteen other members present.

Awards Recommended;—

First-class Certificate.

To *Cypripedium* × 'Perseus' ('Alcibiades' × 'Lady Dillon'), from Lieut.-Col. Sir George Holford, K.C.V.O., Westonbirt, Tetbury, Gloucestershire. Of fine formation and rich colour. The roundly formed dorsal sepal white, green at the base, marked with large crimson spots on the lower portion, and with smaller ones on the upper area; petals and labellum broadly developed, of shining mahogany-red colour, and margined with yellow; a conspicuous feature is the yellow staminode. This plant received an Award of Merit, January 14, 1919, when shown by Mr. W. R. Lee, Plumpton Hall, Heywood, Lancashire.

Silver Banksian Medal.

To Messrs. Sanders, St. Albans, for group of *Cymbidiums* and *Cypripediums*.

Bronze Lindley Medal.

To Mr. S. Lyne, Orchid-grower to J. J. Bolton, Esq., Claygate, Surrey, for skilful cultivation of *Odontoglossum* × *ardentissimum* var. 'Pintadeau', bearing a branched spike with a total of 83 flowers.

AWARDS TO SUNDRIES MADE DURING 1924.

THESE AWARDS ARE VALID FOR TEN YEARS AND LAPSE IN 1934

GREASE FOR BANDING FRUIT TREES.

Award of Merit.

1. Bandite Tanglefoot from Messrs. Strawson.
2. Moth Grip from Messrs. W. Wood of Taplow.
3. Takitak from Messrs. Craven of Evesham.

Highly Commended.

4. Orbite from Messrs. Kay.

SPRAYING MATERIALS.

Highly Commended.

5. Cresofin from Messrs. Craven, Evesham.
6. Dry Carl Arsenate of Lead Powder from Messrs. Voss, Millwall, E. 14.
7. Soluble Casein to act as a Spreader from Messrs. Murphy of Mortlake.

TOOLS AND APPARATUS.

Award of Merit.

8. Bulb Planter from Messrs. Barr, Covent Garden.
9. Hedge Clipper from Messrs. Hansen of Astor House, W.C.

Commended.

10. Wall Brackets from House and Garden Sundries, 10 Eastcheap, E.C.

SPRAYING APPARATUS.

Award of Merit.

11. Florist's Friend Spraying Syringe No. 2 from Messrs. French, 23 St. Mary Street, Ladywood, Birmingham.
12. Mysto Hand Sprayer No. 4 from Messrs. French.
13. Queen Pneumatic Hand Sprayer from the Stonehouse Works, Spon Lane Mills, West Bromwich.
14. Martsmith Pneumatic Knapsack Sprayer No. 2 from Messrs. Martineau & Smith, 56 Holloway Road, Birmingham.
15. Iron Arm Knapsack Sprayer No. 7 from Messrs. Milward, Washford Mills, Redditch.
16. Vermorel Eclair Special Brass Alloy Knapsack Sprayer from Messrs. Cooper, Pegler, 24 Christopher Street, Finsbury Square, London.
17. Vermorel Bucket Pump from Messrs. Cooper, Pegler.
18. Vermorel Salva Bucket Pump from Messrs. Cooper, Pegler.
19. Four Oaks Battle Pattern Sprayer from the Four Oaks Spraying Machine Co., Sutton Coldfield, Birmingham.
20. Craven Headland Pump from Messrs. Craven, Evesham.

Highly Commended.

21. Agriculturist Spraying Machine from Messrs. French.
22. Martsmith Headland Portable Spraying Pump from Messrs. Martineau & Smith.
23. Vermorel Torpille No. 1 Knapsack Dry Sprayer from Messrs. Cooper, Pegler.
24. New Tornado Dry Sprayer from Messrs. Craven.

Commended.

25. Florist's Favourite Spraying Syringe No. 795c from Messrs. Martineau & Smith.
26. Patent Spraying Syringe No. 902B from Messrs. Martineau & Smith.
27. Florist's Friend Spraying Syringe No. 9 from Messrs. French.
28. Mikado Bucket Pattern Spraying Machine from the Stonehouse Works Co.
29. Khedive Bucket Pattern Spraying Machine from the Stonehouse Works Co.
30. Baby Wonder Dry Sprayer from Messrs. Craven.

AWARDS TO SUNDRIES LAPSING, 1926.

Awards are made to Horticultural Sundries after trial and under the regulations published in the R.H.S. Book of Arrangements. These awards are valid for ten years from the date at which they are made ; at the end of ten years they lapse.

The following awards are therefore no longer valid after 1926. For the announcement of the award see R.H.S. JOURNAL, Vol. 42, p. ccv.

Southern Cross Spraying Pump,
Little Wonder Dry Powder Sprayer,
Streatley Hand Pneumatic Sprayer,
all from Messrs. The Four Oaks Co., Sutton Coldfield.
Adjustable Sand Distributor,
Turf Renovator,
both from Messrs. H. Pattison, Greyhound Lane, Streatham, S.W.

DONORS OF SEEDS, PLANTS, BOOKS, &c., TO THE SOCIETY'S
LABORATORY AND GARDEN AT WISLEY DURING THE YEAR
1924.

- ABBISS, H. W., Truro. Broccoli crosses for trial.
ADAMS, Mrs. POURYS, Torquay. *Tibouchina stenocarpa*.
ARBUTHNOT, A. E., Hayling Island. *Tetraclemis articulata*.
ASHTON, Lt.-Col. C. G., United Service Club, London. Gift of £2 2s.
AUBIN, P., Jersey. Fig cuttings.
BACKHOUSE, Messrs., York. Cos Lettuce 'Champion White' for trial.
BAILLIE, H., Wellington, N.Z. Collection of seeds.
BAKER, E. H., Northampton. Broccoli for trial.
BALCOMBE, W., Malmesbury. Cuttings of *Salvia fulgens*.
BALLARD, E., Colwall, nr. Malvern. Asters for trial.
BARCHARD, F., Uckfield. Daffodils for trial.
BARNARD, Mrs. T. H., Towcester. Plants from New Hebrides.
BARR, Messrs., London. Seeds from New Zealand, Scabious, Dwarf Beans, Endives, Cos Lettuce, Broccoli, *Abroma fastuosa*, *Campanula sarmatica*, *Fritillarias*, Daffodils, *Olearia semidentata*, *Senecio Huntii*, *Coprosoma*, Asters, Sweet Peas, for trial.
BARTHOLOMEW, A. C., Reading. Collection of seeds.
BARTON NURSERIES, Wisbech. Daffodils for trial.
BATH, Messrs., Wisbech. Red Currant 'Earliest of Fourlands' for trial.
BATTISCOMBE, E., Nairobi. Seed of *Begonia keniensis*.
BEALE, P. T. B., Lymington. Zephyranthes bulbs and seed of *Lilium regale*.
BEES, Messrs., Chester. Roses and Sweet Peas for trial.
BERROW, Miss I. A. E., Vincent Square, London. Ivy geranium var., *Ophrys apifera*, Locust Bean plants.
BEWES, Mrs. E. E., Denham. Blackberry.
BLACK, R. A., Hobart, Tasmania. Collection of Tasmanian seeds.
BLISS, A. J., Tavistock. Daffodils for trial.
BOLTON, Messrs., Halstead. Sweet Peas for trial.
BONES, T., Cheshunt. Asters for trial.
BOWDEN, W. D., Sierra Leone. Bulbs; Sweet Pea seed.
BOWLES, E. A., M.A., V.M.H., Waltham Cross. *Hemiphragma heterophyllum*, *Ranunculus millefoliatus*, *Leontopodium* sp., *Echium rubrum*.
BROOKLYN BOTANIC GARDEN, N.Y., U.S.A. Collection of seeds.
BROWN, Messrs., Poulton-le-Fylde. Broccoli for trial.
BROWN, Messrs., Rothwell. Broccoli for trial.
BRYSON, Miss A. C., London. Copy of Baker's "Irideæ" for library.
BUATOIS, E., Dijon, France. Roses for trial.
BUNYARD, Messrs., Maidstone. Apple buds and grafts; Raspberry 'Profusion'; Broccoli; *Prunus Pseudocerasus*.
BURNETT, E. M., Southampton. *Illicium religiosum*.
BURPEE, Messrs., Philadelphia, U.S.A., Dwarf Beans, Endives, Lettuces, Broccoli, for trial.
BURRELL, R. J., Bury St. Edmunds. Buds of "Special" Myrobalan Plum.
BURRELL, Messrs., Cambridge. Dahlias for trial.
BUTCHER, WALTER, Angmering. Potato 'Southdown' for trial.
BYNG, Lady, of VIMY. Seeds of Blue-fruited Elder.
BYRNE, Mrs., Horsham. *Syringa reflexa* (seed).
CAMBRIDGE BOTANIC GARDEN. Collection of seeds, plants of *Saxifraga Brunonian*.
CAMPBELL, Mrs., Citrus sp. fruit.
CARLILE, T., Twyford. Tree Lupines 'Light of Loddon'.
CARNIE, A. R., London. Lettuces for trial.
CARPENTER, G., Byfleet. Grafts of Apples and Plums for trial.
CARSE of GOWRIE NURSERY Co., Errol. Black Currants for trial.
CARTER, Messrs., Raynes Park. Dwarf Beans, Broccoli, Potatoes, Lettuces, for trial.
CARTWRIGHT & GOODWIN, Messrs., Kidderminster. Daffodil 'Killarney' for trial.

- CAVE, G. H., Darjeeling, India. Collection of seeds.
- CHAPLIN, DAVID, Ascot. *Viola gracilis* 'Gyp' and 'Lassie.'
- CHAPMAN, Messrs., Rye. Daffodils for trial.
- CHEAL, Messrs., Crawley. Apple grafts, Dahlias, for trial.
- CHELSEA PHYSIC GARDEN. Collection of seeds.
- CHRISTY, W. M., Emsworth. Cuttings of *Helianthemums*.
- CLARKE, Miss C. A., Karachi. Pod of *Cistanche*.
- CLIBRANS, Messrs., Altrincham. Beans and Lettuce for trial.
- CLUCAS, J. L., Ormskirk. Lettuces, Cabbage, Savoy, for trial.
- COBB, A. J., Reading. Dahlias for trial.
- COBLEY, Messrs., London. Daffodils for trial.
- COLENUTT, G. W., Ryde. Plants of Hanway Berry.
- COOLING, Messrs. G., Bath. Dwarf Bean, Lettuces, for trial.
- COOPER, C., Sutton. Two books for library.
- COOPER TABER, Messrs., London. Beans, Lettuces, Endives, Broccoli, Pea, for trial.
- CORY, R., Duffryn, Cardiff. *Iris laevigata*.
- COW, Mrs. DOUGLAS, Streatham. Collection of seeds from Sahara.
- COX, L. H., Newick, Sussex. Asters for trial.
- CRANFIELD, W. B., Enfield. Daffodils for trial.
- CRIMEA BOTANIC GARDEN. Collection of seeds.
- CULLEN, Messrs., Witham. Lettuces, Endives, Dwarf Beans, Sweet Peas, Broccoli, for trial.
- DAEHNFELDT, Messrs. L., Ltd., Odense, Denmark. Annual Scabious, Dwarf Beans, for trial.
- DANIELS BROS., Messrs., Norwich. Potato, Dwarf Bean, Lettuce, Broccoli, for trial.
- DAVIDSON, Mrs., Gatooma, Rhodesia. Gift of one guinea.
- DAWKINS, A., Chelsea. Lettuces for trial.
- DENNY, Mrs., Godalming. Seedling *Artemisia*.
- DEVENISH, J. A., Staveron, Devon. Grafts and buds of Apple 'Peter Lock.'
- DICKS, Messrs., Manchester. Lettuces, Dwarf Bean, Broccoli, for trial.
- DICKSON, Messrs. ALEX., Belfast. Roses, Lettuces, Endive, Dwarf French Beans, Broccoli, Roses, Sweet Peas, for trial.
- DICKSON & ROBINSON, Messrs., Manchester. Lettuces, Broccoli, Dwarf Bean, Asters, for trial.
- DICKSON, BROWN & TAIT, Messrs., Manchester. Lettuces for trial.
- DICKSONS, Messrs., Chester. Lettuces for trial.
- DIGBY, Miss E., Colchester. Copy of Miss Willmott's "Roses" for library.
- DIXON, E., Putney. Plants *Campanula* 'Spetchley.'
- DOBBIE, Messrs., Edinburgh. Endives, Lettuces, Sweet Peas, Scabious, Dwarf Beans, Potatos, Broccoli, for trial.
- DORRIEN-SMITH, Maj. A. A., Isles of Scilly. Sweet-scented Pelargoniums.
- DOT, S. PEDRO, San Felice de Llobregat. Rose 'Mari Dot' for trial.
- DOWSON, W. J., M.A., Guildford. Seeds of *Nymphaea zanzibariensis*.
- DREER, Messrs., Riverton, N.J., U.S.A. Roses for trial.
- DRUMMOND, Messrs., Stirling. Lettuces for trial.
- DURHAM, Lt.-Col. F. R., Kew. Seeds of *Anagyris foetida*.
- DYKES, W. R., M.A., R.H.S., London. Seed of *Iris Douglasiana*.
- EAST MALLING RESEARCH STATION. Myrobalan Stocks, Black Currants, for trial.
- EDINBURGH ROYAL BOTANIC GARDEN. Collection of seeds.
- ELEY, C., Colchester. *Buddleia* sp. aff. *Forrestii*.
- ELLIOTT, CHAS., Park Ridge, Ill., U.S.A. Dwarf Beans, Sweet Peas, for trial.
- ENGLAND, C. T., Exeter. Daffodils for trial.
- EVANS, F., Reading. Roses for trial.
- FINDLAY, A. D., Auchtermuchty, Fife. Potatos for trial.
- FINNEY, Messrs., Newcastle-on-Tyne. Broccoli, Lettuces, for trial.
- FISHER, SON & SIBRAY, Messrs., Sheffield. Lettuce 'F's Superb Summer' for trial.
- FLUX, Miss K. A., Buckhurst Hill, Essex. Seedling Pink for trial.
- FORSYTH, H. G., Benoni, Transvaal. *Gladiolus psittacinus* bulbs.
- FREWEN, Lt.-Com. O., Brede Place, Sussex. Acorns of *Quercus rubra*.
- FULLEGAR, N., Compton. Graft of Apple 'Ribston Pearmain' for trial.
- GALSWORTHY, F., Chertsey. Six pictures for laboratory.
- GALT, A. S., Leeds University. Grafts of Apples 'Cockpit,' 'Ringer.'
- GARDEN SUPPLIES, LTD., Liverpool. Potatos for trial.
- GASKELL, A. J., Helston. Plants of Violet 'La France.'
- GAUTREY, H. J., Cottenham. Grafts of Apple 'Cottenham Seedling.'

CXX PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

- GIBBS, Hon. VICARY, Elstree. Collection of Shrubs; Michaelmas Daisies, Dahlia, for trial.
- GIBSON, G. W., Isles of Scilly. Grafts of Apple 'Scilly Pearl,' Bulbs of *Amaryllis Belladonna*.
- GLASGOW BOTANIC GARDENS. Collection of seeds.
- GLASNEVIN BOTANIC GARDENS, Dublin. Collection of seeds.
- GOOD, G. P., Bushey Grove. Apple trees 'Bushey Grove.'
- GOODMAN, A., Bedford. Broccoli for trial.
- GÖTEBORG, Botaniska Trädgården. Collection of seeds.
- GREEN, HERBERT, Maidstone. Collection of seed from New Zealand.
- GREY, C. F., Aberlour. Rooted cutting of pink.
- HAAGE & SCHMIDT, Messrs., Erfurt, Germany. Lettuces for trial.
- HAMILTON, W. F., Lymington. Miscellaneous shrubs and plants.
- HANBURY, C., Ventimiglia, Italy. Collection of seeds.
- HANBURY, F. J., E. Grinstead. Miscellaneous plants, etc.
- HANSON, Miss A. R., Oxford. Seeds of Waratah, and Norfolk Island Pine.
- HARLEY, A., Kirkcaldy. *Gentiana sino-ornata*.
- HARRISON, Messrs., Leicester. Dwarf Beans, Lettuces, Potato, Broccoli, for trial.
- HAY, T., Hyde Park. Miscellaneous Plants.
- HAZLEWOOD, Messrs., Epping, N.S.W., Australia. Roses for trial.
- HEINEMANN, F. C., Erfurt, Germany. Scabious, Endive, French Beans, for trial.
- HILL, H., Exeter. Broccoli for trial.
- HILLIER, Messrs., Winchester. Seeds of Shrubs.
- HINTON, Dr. H. T. Sweet Peas for trial.
- HOLMES, ROBT., Norwich. Sweet Pea for trial.
- HOMEWOOD, T. G., Ealing. Tonga Beans from New Zealand.
- HOUSE, Messrs., Bristol. Graft of Apple 'John Standish.'
- HURST, Messrs., London. Lettuces for trial.
- ILOTT, MONTAGUE, Enfield. Saxifragas.
- INGWERTSON & JONES, Messrs., Letchworth. *Saxifraga Cotyledon caterhamensis*.
- IRELAND, G. H., Bude. Seed of *Aquilegia fragrans*.
- IRELAND & HITCHCOCK, Messrs., Marks Tey. Sweet Peas for trial.
- JARMAN, Messrs., Chard. Dahlias for trial.
- JEFFERIES, Messrs., Cirencester. Roses for trial.
- JEKYLL, Miss, Godalming. Miscellaneous seeds and plants.
- JERRAM, Mrs., Polperro, Cornwall. Collection of Kashmir seeds.
- JERSEY NURSERIES. Roses for trial.
- JEX-BLAKE, Lady MURIEL, Nairobi. Seeds of Hibiscus and Delphinium.
- JOHN INNES HORT. INST., Merton. Plant of *Symphytum peregrinum*.
- JOHNSON, A. T., Ro Wen, Talycain, N. Wales. *Geranium anemoneae-folium*, *Veronica peduncularis*.
- JONES, E. MARSDEN, Potterne, Devizes. *Anemone nemorosa*.
- JONES, H., Letchworth. Grafts of Apple 'Redcoat Grieve' for trial.
- JONES, H., Market Drayton. Black Currants for trial.
- JONES, H. J., Lewisham. Asters for trial.
- JONES, J. W., Woking. Seeds of *Narcissus triandrus*.
- KELSEY, G. T., Chessington, Surrey. Buds of Apples for trial.
- KELWAY, Messrs., Langport. French Beans, Lettuces, Sweet Peas, Scabious, Asters, for trial.
- KENT & BRYDON, Messrs., Darlington. Potato 'Catriona,' Broccoli for trial.
- KEW, ROYAL BOTANIC GARDENS. Collection of seeds.
- KING, Messrs. E. W., Coggeshall. Sweet Peas.
- KING, Messrs. J. K., Coggeshall. Sweet Peas, Lettuces, for trial.
- KIRSTENBOSCH, NATIONAL BOTANIC GARDENS. Collection of bulbs and seeds.
- LANGRIDGE, Mrs., Mua Park, Kenya Colony. Seeds of indigenous Lupine.
- LAWRANCE, C. F., Northampton. Scions of Apple 'Edie's Magnum.'
- LAXTON, Messrs., Bedford. Black Currants, Apple grafts, Plum buds, Gooseberries, for trial.
- LEEDS UNIVERSITY. Bulletin No. 136 for library.
- LEENDERS, M., Steyl-Tegelen, Holland. Roses for trial.
- LEPARD, Mrs., Ringwould, Kent. Seeds of *Anemone sulphurea*.
- LILLE, LEONARD, 107, Cours Emile Zola, Lyon-Villeurbanne, France. Rose 'Baby Faurex' for trial.
- LODER, G. W. E., Abinger House, Brighton. Seed of *Caryopteris glutinosa*.
- LOTHOUSE, T. ASHFORD, Linthorpe, Middlesbrough. Collection of seeds and plants.

- LOWER, Dr. N. G., Radnor. Daffodils for trial.
 LYNN, Messrs., Wisbech. Raspberry canes for trial.
 LYON BOTANIC GARDEN. Collection of seeds.
 LYTTTEL, Prof., Southampton. Cuttings of *Viburnum Harryanum*, *Vaccinium padifolium*, *Galium olympicum*.
 McLAREN, Hon. H. D., Tal-y-cafn. *Pinus Bungeana*, *Clematis Armandii*.
 MAGOR, E. J. P., St. Tudy. Rhododendrons.
 MAY, H. B., V.M.H., Chingford. Copies of old catalogue and fern book. Portrait of the donor for the laboratory.
 MAYHEW, Mr., Northumberland. Spring cabbage.
 MILLWARDS, Messrs., Manchester. *Uspulum* and *Venetan* for trial.
 MORSE, Messrs., San Francisco, U.S.A. Sweet Peas, Lettuces, for trial.
 MUNRO, Miss E., Lyme Regis. Plants of *Anthericum Liliago*.
 MUSGRAVE, C. T., Godalming. Cuttings of *Cydonia jap. Simonsii*; various seeds and plants.
 MYERS, W. H., Bishop's Waltham. Grafts of Apple 'Beauty of Hants.'
 NALDRETT, H. A., London. Dwarf Bean 'Early Warwick' for trial.
 NAPLES, UNIVERSITY BOTANIC GARDEN. Collection of seeds.
 NEAL, Messrs., Wandsworth. Trees and grafts of Apple 'George Neal' for trial.
 NEWDEGATE, Sir F. A. N., K.C.M.G., Nuneaton. Seeds of *Templetonia retusa*.
 NEWNHAM, Col. C. C., E. Farleigh, Kent. Seeds of Kashmir white single Pæony.
 NICHOLSON, Mr., Seeds of S. African plants.
 NIX, C. G. A., V.M.H., Crawley. Cuttings of *Rhododendron micranthum* and *Deutzia longifolia*.
 NONIN, AUGUSTE, Châtillon-sous-Bagneux, France. Roses for trial.
 NORTH-CROFT, H. N., Auckland, N.Z. *Parsonsia heterophylla*.
 NOTCUTT, R. C., Woodbridge. Plant of *Ginkgo biloba*.
 NUTTING, Messrs., London. Dwarf Beans, Lettuces, Endives, Scabious, Brocc
 OATWAY, G. H., London. Seeds of *Celmisias* and *Veronica*.
 O'MAHONY, THE, Aughrim, co. Wicklow. Pin-eyed *Primula Winteri*.
 OSBORNE, W. G., Leckford Abbess. Broccoli for trial.
 OXFORD BOTANIC GARDEN. Collection of seeds.
 PARKER, R. N., Dehra Dun, U.P. India. Seeds of *Berberis*.
 PATEMEN, T., Brockett Hall Gardens, Hatfield. Raspberries 'Brockett Hall' for trial.
 PEARSON, J. R., Lowdham. Broccoli, Daffodils, for trial.
 PERRY, A., Enfield. Collection of seeds.
 PRITZER, W., Stuttgart, Germany. Lettuces for trial.
 POULTON, Miss, Christchurch, N.Z. Seed of *Sophora chathamica*.
 PRABGER, R. L., National Library of Ireland, Kildare Street, Dublin. *Semper-vivella alba*.
 PROSKAU BOTANICAL GARDEN. Collection of seeds.
 RAGIONIERI, Dr. A., Castello, Italy. *Ranunculus* roots.
 RASMUSSEN, J., Åkarp, Sweden. Peas, Dwarf Beans, Beets.
 READ, Miss M., Lily bulb from Uganda.
 REYNOLDS, Mrs. N., Vitzoran, Switzerland. Small pieces of collected plants.
 REYNOLDS, S. J., St. Moritz, Switzerland. Plants from Suvretta Valley and Alp Gruar.
 RICHARDSON, J. L., Waterford. Daffodils for trial.
 RIVERS, Messrs., Sawbridgeworth. Buds of Cherries for trial.
 RIVOIRE, Messrs., Lyon, France. Dahlia, Beans, Lettuces, for trial.
 ROBINSON, A., Chislehurst. Layers of *Berberis vulgaris asperma*.
 ROBINSON, H., Barbage, Lincs. Broccoli for trial.
 ROGERS, R. B., Launceston. Collection of seed.
 ROOKE, Messrs., Birmingham. 'Curlitop' Plant Support for trial.
 ROTCH, C. D., Teddington. Liliums.
 ROTHSCHILD, LIONEL N. DE, Exbury. Daffodil 'Chineta' for trial.
 ROYAL BOTANIC SOCIETY OF LONDON. Collection of seeds.
 RUSSELL, Mrs., Adis Ababa, Abyssinia. Collection of seeds.
 RUYS, Messrs., Dedemsvaart, Holland. Delphiniums, Asters, for trial.
 RYDER, Messrs., St. Albans. Sweet Peas for trial.
 SADLER, W. T., Streatham. Aster Plant (Novi-Belgii).
 SALMON, C. E., Reigate. Miscellaneous seeds.
 SAMUEL, Sir STUART, Nutley. Seeds of *Styrax officinalis*.
 SAVERY, G. B., Exeter. Daffodils for trial.
 SAWBRIDGE, Mrs., London. Seeds of Lupine from Australia.
 SCAPLEHORN, E., Beckenham. Collection of plants.
 SCARLETT, J. W., Musselburgh. Potatos, Broccoli, for trial.

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- SCRASE-DICKENS, C. R., Horsham. *Berberis Fortunei*, *Rubus Lambertianus*.
 SEABROOK, Messrs., Chelmsford. Grafts and buds of Apple 'Seabrook's Red,'
 Apple Scions, for trial.
 SHEPPEE, A. J., Bracknell. Bulbous plant for naming from Gaza.
 SIMMONDS, E. C., Reigate. Bulb of *Scilla autumnalis* from Salonika.
 SIMPSON, Messrs. W. H., Birmingham. Lettuce, Scabious, Potatos, Sweet Peas,
 Dwarf Beans, Broccoli, for trial.
 SKELTON, R. T., Armstrong, British Columbia. Seed of scarce primrose yellow
 perennial.
 SLUIS EN GROOTS, Messrs., Enkhuizen, Holland. Lettuces for trial.
 SMURTHWAITE, Messrs., North Shields. Broccoli for trial.
 SPRUIJT, Messrs., Utrecht, Holland. Lettuces for trial.
 STANLEY, Lady BEATRIX, Market Harborough. *Berberis* 'Sibbertoft Coral.'
 STARK, Messrs. G., Great Ryburgh. Potatos, Sweet Peas for trial.
 STEVENSON, J., Wimborne. Sweet Peas for trial.
 STEWART, Messrs., Ferndown. Miscellaneous plants.
 STORRIE & STORRIE, Messrs., Perthshire. Grafts of Apple 'Cutler Grieve' for
 trial.
 STREDWICK, Messrs., St. Leonards-on-Sea. Dahlias for trial.
 STUART, Mrs., Edinburgh. Collection of seeds from Libyan Desert.
 STURGES, Mrs., Malvern Wells. Plants.
 SUTTON, Messrs., Reading. Seeds of *Festuca arenaria*.
 SYDENHAM, Messrs. R., Ltd., Birmingham. Lettuce for trial.
 TEMPLE, Mr. Spring Cabbage.
 THOMAS, N. R. W., c/o Colonial Institute, London. Seeds of *Pohutukawa*,
Metrosideros, *Veronica*.
 THOMSON, Dr. W. M., Hawera, Taranaki, New Zealand. Collection of seeds.
 THORNE, Dr. Y. N., Betchworth. Bulbs of Lily.
 TOOGOOD, Messrs., Southampton. Lettuces, Broccoli, for trial.
 TORKINGTON, Mrs. E., Maidenhead. Seeds and plant from Monte Carlo.
 TOWNSEND, G. H., Duncans, Vancouver Island. Lilies.
 TRESEDER, Messrs., Cardiff. Dahlias for trial.
 TROUP, R., Bridgwater. *Ornithogalum lacteum*.
 TRUFFAUT, GEORGES, Versailles. Lettuces, Insecticides, Fertilizers, for trial.
 TURNER, CHAS., Slough. Trees of Apple 'Arthur Turner,' Dahlia 'Lydia'
 for trial.
 TYLER, Messrs., Norwich. Black Currants for trial.
 UNWIN, W. J., Histon. Sweet Peas for trial.
 UPPSALA UNIVERSITY BOTANIC GARDEN, Sweden. Collection of seeds.
 VAN BEUSCKOM, C., Arnhem, Holland. Lettuces for trial.
 VANDERSCHOOT, J. D., Hillegom, Holland. Daffodils for trial.
 VEITCH, Messrs. R., Exeter. Sweet Peas, Broccoli, Scabious, Endives, Lettuces,
 Celery, Carrot, Dwarf Beans, for trial; *Iris stylosa* 'Imperatrice Elizabeth,'
Plagianthus Lyallii.
 VICKERS, V. C., Royston. Raspberries.
 VILLIERS-STUART, Miss, Camberley. Cassia pods.
 VILMORIN-ANDRIEUX ET CIE, Messrs., Paris. Collection of seeds.
 VILMORIN, J. DE, Loviet, France. Collection of seeds.
 WACHER, Dr., Canterbury. Seeds and plants.
 WAKELY, C., E. Anglian Inst. Agric. Currant 'Rivers' Late Red.'
 WALKER, Mrs. H. A., Tunbridge Wells. Bulb of *Leontice altaica* from Gallipoli,
 seeds.
 WALLACE, Messrs., Dunstable. Black Currant seedlings for trial.
 WALLACE, Messrs., Tunbridge Wells. Plant *Enkianthus cernuus rubens*, *Mecon-*
opsis simplicifolia.
 WALLER, Messrs., Guadalupe, California. Sweet Peas, Scabious, for trial.
 WALLIS, R. J., Merriott, Somerset. Rose 'Lemon Pillar.'
 WARBURG, O. E., Epsom. Miscellaneous plants.
 WATKINS & SIMPSON, Messrs., London. Scabious, Beans, Lettuces, Broccoli,
 for trial; seed of *Salvia splendens* 'Harbinger,' Dahlia 'Coltness Hybrids.'
 WATSON, Messrs., Killiney. Crimson Broom, 'Dorothy Walpole.'
 WAY, R. E., Guildford. *Tradescantia brevicaulis*.
 WEBB, Messrs., Stourbridge. Lettuces, Endive, Dwarf Beans, Sweet Peas,
 Broccoli, Potatos.
 WELSH BULB FIELDS, St. Asaph. Daffodils for trial.
 WEST, J. T., Brentwood. Dahlia 'Merlin.'
 WETTERN, H. L., Oxted. Cuttings of *Rosa rubrostaminea*.
 WIGGIN, A. H., Alvechurch. *Pyrus salicifolia* (fruit).
 WILLIAMS, J. C., Gorran. Seeds *Prunus* sp.

- WILLIAMS, P. D., St. Keverne. Daffodils for trial.
WILSON, E. H., Arnold Arboretum, Harvard. Seeds of *Pentactina rupicola*.
WILSON, G. L., Broughshane, co. Antrim. Daffodils for trial.
WOODCOCK, F. C., Walmer. Sweet Peas for trial.
WOOLMAN, H., Shirley, Birmingham. Dahlias for trial.
WORMALD, Major J., East Dereham. Plant of Oxlip for identification.
YATES, Messrs., Evesham. Dwarf Bean 'Delight' for trial.
YATES, SAMUEL, Manchester. Broccoli for trial.
ZAAZAADVEREENIGING NUNHEM, Limburg, Holland. Lettuces for trial.
ZWAAN & DE WILJES, Messrs., Scheemda, Holland. Lettuces for trial.

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